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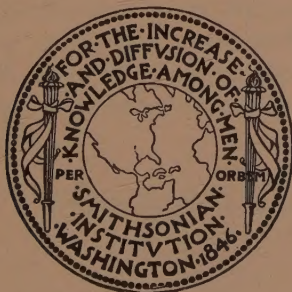
OF THE

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The publications of the National Museum consist of two series: Proceedings and Bulletins.

The Proceedings, the first volume of which was issued in 1878, are intended primarily as a medium of publication for newly-acquired facts in biology, anthropology, and geology, descriptions of new forms of animals and plants acquired by the National Museum, discussions of nomenclature, etc. A volume is issued annually for distribution to libraries, while in view of the importance to science of the prompt publication of descriptions of new species, a limited edition of each paper is printed in pamphlet form in advance.

The present volume is the twenty-fourth of the series.

The Bulletin, publication of which was begun in 1875, is a series of elaborate papers, issued separately and based for the most part upon collections in the National Museum. They are monographic in scope, and are devoted principally to the discussion of large zoological groups, bibliographies of eminent naturalists, reports of expeditions, etc.

A quarto form of the Bulletin, known as the "Special Bulletin," has been adopted in a few instances in which a larger page was deemed indispensable.

The Annual Report of the National Museum (being the second volume of the Smithsonian Report) contains papers chiefly of an ethnological character, describing collections in the National Museum.

Papers intended for publication by the National Museum are usually referred to an advisory committee, composed as follows: Frederick W. True (chairman), William H. Holmes, George P. Merrill, James E. Benedict, Otis T. Mason, Leonhard Stejneger, Lester F. Ward, and Marcus Benjamin (editor).

S. P. LANGLEY,
Secretary of the Smithsonian Institution.

TABLE OF CONTENTS.

	Page.
BANKS, NATHAN. Some Spiders and Other Arachnida from Porto Rico.—No. 1253, October 4, 1901 ¹	217-227
New species: <i>Pardosa porto-ricensis</i> , <i>Prostheclina signata</i> , <i>Cynorta obscura</i> , <i>Stygnus insulanus</i> .	
BUSCK, AUGUST. A Review of the American Moths of the Genus <i>Depressaria</i> Haworth, with Descriptions of New species.—No. 1268. May 12, 1902 ¹	731-749
New species: <i>Depressaria sanguinella</i> , <i>D. muricolorella</i> , <i>D. senicionella</i> , <i>D. canadensis</i> , <i>D. betulella</i> , <i>D. barberella</i> .	
CHAMBERLIN, RALPH V. <i>Henicops Dolichopus</i> , a New Chilopod from Utah.—No. 1270. May 24, 1902 ¹	797-800
New species: <i>Henicops dolichopus</i> .	
———. List of the Myriapod Family Lithobiidae of Salt Lake County, Utah, with Descriptions of Five New Species.—No. 1242. September 27, 1901 ¹	21-25
New species: <i>Lithobius utahensis</i> , <i>L. collium</i> , <i>L. socius</i> , <i>L. intermontanus</i> , <i>L. purpureus</i> .	
COQUILLET, D. W. New Diptera from Southern Africa.—No. 1243. September 27, 1901 ¹	27-32
New genus: <i>Zaprionus</i> .	
New species: <i>Simulium nigratarsis</i> , <i>Dacus lounsburyi</i> , <i>D. brevis</i> , <i>D. sigmoides</i> , <i>D. immaculatus</i> , <i>Ceratitis rubivora</i> , <i>C. lycii</i> , <i>Zaprionus vittiger</i> .	
DALL, WILLIAM HEALEY. Illustrations and Descriptions of New, Unfigured, or Imperfectly Known Shells, Chiefly American, in the U. S. National Museum.—No. 1264. March 31, 1902 ¹	499-566
New genera: <i>Toledonia</i> , <i>Antistreptus</i> .	
New section: <i>Agriopoma</i> .	
New species: <i>Conus stimpsoni</i> , <i>Daphnella eugrammata</i> , <i>Actæon</i> (<i>Microglyphis</i>) <i>breviculus</i> , <i>Toledonia perplexa</i> , <i>Pleurotoma</i> (<i>Antiplanes</i>) <i>piona</i> , <i>P.</i> (<i>Antiplanes</i>) <i>thalæa</i> , <i>P.</i> (<i>Antiplanes</i>) <i>santarosana</i> , <i>P. callicesta</i> , <i>Tritonofusus</i> (<i>Plicifusus</i>) <i>herendeeni</i> , <i>Volutopsius trophonius</i> , <i>Antistreptus magellanicus</i> , <i>Trophon pelecetus</i> , <i>Boreotrophon maclaini</i> , <i>B. kamchatkanus</i> , <i>B.</i> (<i>Stuarti</i> var.?) <i>smithi</i> , <i>B. peregrinus</i> , <i>B. beringi</i> , <i>B. pacificus</i> , <i>B. triphorus</i> , <i>B. alaskanus</i> , <i>B. mazatlanicus</i> , <i>B. panamensis</i> , <i>B. avalonensis</i> , <i>B. rotundatus</i> , <i>Trophon pinnatus</i> , <i>Typhis martyria</i> , <i>Litorina atkana</i> , <i>Solariella carlotta</i> , <i>Ganesa?</i> <i>panamensis</i> , <i>Lepidopleurus mesogonus</i> , <i>L. halistreptus</i> , <i>L. luridus</i> , <i>L. farallonis</i> , <i>Ischnochiton stearnsii</i> , <i>I. sarcosus</i> , <i>Crenella megas</i> , <i>Limopsis panamensis</i> , <i>Cetoconcha scapha</i> , <i>Terebratalia hemphilli</i> , <i>Crania patagonica</i> .	

¹ Date of publication.

	Page.
JORDAN, DAVID STARR, and EDWIN CHAPIN STARKS. A Review of the Atherine Fishes of Japan.—No. 1250. October 4, 1901 ¹	199-206
New genera: <i>Atherion</i> , <i>Iso</i> .	
New species: <i>Atherina woodwardi</i> , <i>A. tsurugæ</i> , <i>Atherion elymus</i> , <i>Iso flos-maris</i> .	
——, and JOHN OTTERBEIN SNYDER. A Review of the Discobolous Fishes of Japan.—No. 1259. February 10, 1902 ¹	343-351
New genus: <i>Crystallias</i> .	
New species: <i>Lethotremus awæ</i> , <i>Crystallias matsushimæ</i> .	
——. A Review of the Gobioid Fishes of Japan, with Descriptions of Twenty-one New Species.—No. 1244. September 25, 1901 ¹	33-132
New genera: <i>Vireosa</i> , <i>Hazeus</i> , <i>Chloea</i> , <i>Suruga</i> , <i>Sagamia</i> , <i>Ainosus</i> , <i>Astrabe</i> , <i>Clariger</i> , <i>Eutemichthys</i> .	
New species: <i>Vireosa hanæ</i> , <i>Asterropteryx abax</i> , <i>Hazeus otakii</i> , <i>Gobius pæciliichthys</i> , <i>Ctenogobius abei</i> , <i>C. hadropterus</i> , <i>C. campbelli</i> , <i>C. virgatus</i> , <i>Chloea mororana</i> , <i>C. sarchynnus</i> , <i>Pterogobius daimio</i> , <i>P. zacalles</i> , <i>P. zonoleucus</i> , <i>Suruga fundicola</i> , <i>Sagamia russula</i> , <i>Chæturichthys sciæstius</i> , <i>Tridentiger bucco</i> , <i>Astrabe lactisella</i> , <i>Clariger cosmurus</i> , <i>Eutemichthys gilli</i> , <i>Trypauchen wakæ</i> .	
——. A Review of the Gymnodont Fishes of Japan.—No. 1254. November 30, 1901 ¹	229-264
New species: <i>Spheroides abbotti</i> , <i>S. exascurus</i> , <i>S. borealis</i> , <i>S. niphobles</i> .	
——. A Review of the Hypostomide and Lophobranchiate Fishes of Japan.—No. 1241. September 27, 1901 ¹	1-20
New genera: <i>Zalises</i> , <i>Yozia</i> .	
New species: <i>Zalises umitengu</i> , <i>Corythoichthys isigakius</i> , <i>Yozia wakanouræ</i> , <i>Urocampus rikuzenius</i> , <i>Hippocampus kelloggi</i> , <i>H. aterrimus</i> , <i>H. sindonis</i> .	
——. A Review of the Labroid Fishes and Related Forms Found in the Waters of Japan.—No. 1266. May 2, 1902 ¹	595-662
New genus: <i>Verreo</i> .	
New species: <i>Stethojulis psacas</i> , <i>S. terina</i> , <i>S. trossula</i> , <i>Halichæres tremebundus</i> .	
——. A Review of the Salmonoid Fishes of Japan.—No. 1265. March 25, 1902 ¹	567-593
New species: <i>Argentina kagoshimæ</i> .	
——. A Review of the Trachinoid Fishes and their Supposed Allies Found in the Waters of Japan.—No. 1263. March 28, 1902 ¹	461-497
New genera: <i>Pteropsaron</i> , <i>Ariscopus</i> , <i>Stalix</i> .	
New species: <i>Parapercis ommatura</i> , <i>Pteropsaron evolans</i> , <i>P. vercundum</i> , <i>Ariscopus iburius</i> , <i>Gnathypops hopkinsi</i> , <i>G. evermanni</i> , <i>Stalix histrio</i> .	

¹ Date of publication.

	Page.
JORDAN, DAVID STARR, assisted by MICHITARO SINDO. A Review of the Japanese Species of Surf-Fishes or Embiotocidæ.—No. 1260. February 26, 1902 ¹	353-359
———. A Review of the Pediculate Fishes or Anglers of Japan.—No. 1261. February 26, 1902 ¹	361-381
New species: <i>Lophomus litulon</i> , <i>Antennarius scriptissimus</i> , <i>A. sanguifluus</i> , <i>A. nox</i> , <i>Malthopsis tiarella</i> .	
LUCAS, FREDERIC A. A Flightless Auk, <i>Mancalla Californiensis</i> , from the Miocene of California.—No. 1245. September 27, 1901 ¹	133-134
LYON, MARCUS WARD, JR. An Annotated List of Mammals Collected in the Vicinity of La Guaira, Venezuela.—No. 1246. October 3, 1901 ¹	135-162
(See also under Robinson, Wirt.)	
MEARNS, EDGAR A. Descriptions of Three New Birds from the Southern United States.—No. 1274. June 2, 1902 ¹	915-926
New subspecies: <i>Coturniculus savannarum floridanus</i> , <i>Progne subis floridana</i> , <i>Sitta carolinensis nelsoni</i> .	
———. The Cacomitl Cat of the Rio Grande Valley.—No. 1251. October 4, 1901 ¹	207-210
MERRILL, GEORGE P. A Newly Found Meteorite from Admire, Lyon County, Kansas.—No. 1273. May 31, 1902 ¹	907-913
———. On a Stony Meteorite, which Fell Near Felix, Perry County, Alabama, May 15, 1900.—No. 1249. October 7, 1901 ¹	193-198
MILLER, GERRIT S., JR. The Mammals of the Andaman and Nicobar Islands.—No. 1269. May 29, 1902 ¹	751-795
New species: <i>Sus nicobaricus</i> , <i>Mus stoicus</i> , <i>M. taciturnus</i> , <i>M. flebilis</i> , <i>M. pulliventer</i> , <i>M. atratus</i> , <i>M. burrus</i> , <i>M. burrulus</i> , <i>M. burrescens</i> , <i>Crocidura nicobarica</i> , <i>C. andamanensis</i> , <i>Pipistrellus camortæ</i> , <i>Hipposideros nicobarulæ</i> , <i>Pteropus faunulus</i> , <i>Macacus umbrosus</i> .	
New subspecies: <i>Tupaia nicobarica surda</i> .	
OBERHOLSER, HARRY C. A Review of the Larks of the Genus <i>Otocoris</i> .—No. 1271. June 9, 1902 ¹	801-884
New subspecies: <i>Otocoris alpestris arctica</i> , <i>O. a. enthymia</i> , <i>O. a. diaphora</i> , <i>O. a. actia</i> , <i>O. a. ammophila</i> , <i>O. a. aphrasta</i> , <i>O. a. leucansiptila</i> , <i>Otocoris longirostris perissa</i> , <i>O. l. argalea</i> , <i>Otocoris penicillata oreodrama</i> .	
———. Catalogue of a Collection of Hummingbirds from Ecuador and Colombia.—No. 1258. January 18, 1902 ¹	309-342
New species: <i>Zodalia thaumasta</i> .	
New subspecies: <i>Topaza pella pamprepta</i> , <i>Boissonneaua flavescens tinochlora</i> , <i>Helianthus exortis soderstromi</i> .	

¹ Date of publication.

RATHBUN, MARY J. Descriptions of New Decapod Crustaceans from the West Coast of North America.—No. 1272. May 23, 1902 ¹	885-905
New species: <i>Oregonia bifurca</i> , <i>Callianassa goniophthalma</i> , <i>Axiu spinulicauda</i> , <i>Calastacus quinqueseriatus</i> , <i>Gennades borealis</i> , <i>Crangon holmesii</i> , <i>C. dalli</i> , <i>C. resima</i> , <i>C. abyssorum</i> , <i>C. aactivis</i> , <i>C. variabilis</i> , <i>C. spinosissima</i> , <i>C. spinirostris</i> , <i>Sclerocrangon alata</i> , <i>Nectocrangon dentata</i> , <i>N. ovifer</i> , <i>N. californiensis</i> , <i>N. levior</i> , <i>Spirontocaris arcuata</i> , <i>S. murdohi</i> , <i>S. truncata</i> , <i>S. Snyderi</i> , <i>S. sica</i> , <i>S. dalli</i> , <i>S. unalaskensis</i> , <i>S. vicina</i> , <i>S. washingtoniana</i> , <i>S. flexa</i> , <i>S. decora</i> , <i>S. tridens</i> , <i>S. townsendi</i> , <i>S. moseri</i> , <i>S. maxillipes</i> , <i>S. brachydactyla</i> , <i>S. kincaidi</i> , <i>S. biunguis</i> , <i>S. stoneyi</i> , <i>S. macrophthalma</i> , <i>Pandalus jordani</i> , <i>P. stenolepis</i> , <i>Pandalopsis aleutica</i> , <i>P. longirostris</i> , <i>P. dispar</i> , <i>Pontonia californiensis</i> , <i>Palæmonetes kadiakensis</i> , <i>Urocaris infraspinis</i> , <i>Hymenodora frontalis</i> , <i>Parapasiphae serrata</i> , <i>Pasiphaea pacifica</i> , <i>P. emarginata</i> , <i>P. corteziiana</i> , <i>P. affinia</i> .	
New subspecies: <i>Crangon alaskensis elongata</i> , <i>Crangon franciscorum angustimana</i> , <i>Pandalus montagui tridens</i> .	
RICHMOND, CHARLES W. An Annotated List of Birds Collected in the Vicinity of La Guaira, Venezuela.—No. 1247. October 3, 1901. ¹	163-178
(See also under Robinson, Wirt.)	
———. List of Generic Terms Proposed for Birds During the Years 1890 to 1900, Inclusive, to which are Added Names Omitted by Waterhouse in his "Index Generum Avium."—No. 1267. May 2, 1902. ¹	663-729
ROBINSON, WIRT, and CHARLES W. RICHMOND. An Annotated List of Birds Collected in the Vicinity of La Guaira, Venezuela.—No. 1247. October 3, 1901. ¹	163-178
New species: <i>Microcerculus pectoralis</i> .	
ROBINSON, WIRT, and MARCUS WARD LYON, JR. An Annotated List of Mammals Collected in the Vicinity of La Guaira, Venezuela.—No. 1246. October 3, 1901. ¹	135-162
New species: <i>Oryzomys medius</i> , <i>Lophostoma venezuelæ</i> .	
SCHAUS, WILLIAM. Descriptions of New American Butterflies.—No. 1262. March 1, 1902 ¹	383-460
New genus: <i>Eucora</i> .	
New species: <i>Dircenna hugia</i> , <i>Leucothyris manora</i> , <i>Episcada pascua</i> , <i>E. carcinia</i> , <i>Pteronymia minna</i> , <i>P. calgiria</i> , <i>P. carlia</i> , <i>P. ilsia</i> , <i>Ithomia salcata</i> , <i>Callolieria toska</i> , <i>Euptychia ocelloides</i> , <i>E. castrensis</i> , <i>E. narapa</i> , <i>E. moneca</i> , <i>E. burgia</i> , <i>E. morima</i> , <i>E. pallega</i> , <i>E. borasta</i> , <i>Lymanopoda varola</i> , <i>Narope marmorata</i> , <i>Acræa ozinta</i> , <i>A. dognini</i> , <i>A. mitama</i> , <i>A. surima</i> , <i>A. quadra</i> , <i>Eresia crina</i> , <i>Phyciodes</i>	

¹ Date of publication.

felbula, *P. sejona*, *P. brancodia*, *P. orticas*, *P. carigia*, *Adelpha goyama*, *A. barnesia*, *Chlorippe laurona*, *Eurygona cucuta*, *E. micela*, *E. rasonea*, *E. tarinta*, *Mesosemia mathania*, *M. friburgensis*, *Lymnus pelta*, *Symmachia eurina*, *S. satema*, *Eucora sanarita*, *Charis incooides*, *C. dukinfieldia*, *Chamælimnas joviana*, *C. similis*, *Mesene strigulata*, *M. martha*, *Bæotis bacænita*, *Calydna zea*, *Caria tabrenthia*, *Apodemia multiplaga*, *Hamearis dovina*, *Lepricornia tristis*, *Lemonias malca*, *Ithomeis lauronia*, *Stalactis sontella*, *S. stellidia*, *Lycæna griqua*, *L. cogina*, *Thecla giapor*, *T. xorema*, *T. carla*, *T. nugar*, *T. atrana*, *T. talama*, *T. normahal*, *T. malta*, *T. vomiba*, *T. vieca*, *T. rickmani*, *T. zurkvizi*, *T. epopeoides*, *T. conoveria*, *T. curtira*, *T. tella*, *T. chaluma*, *T. taminella*, *T. rana*, *T. muattina*, *T. binangula*, *T. bolima*, *T. polama*, *T. foyi*, *T. aritides*, *T. echinita*, *T. guadala*, *T. tigonía*, *T. illex*, *T. hostis*, *T. gentilla*, *T. guzanta*, *T. fosteria*, *T. farmina*, *T. lanckena*, *T. chilica*, *T. humber*, *Leodonta marginata*, *Pieris sublineata*, *Papilio socama*, *Jemadia paulensis*, *J. brevipennis*, *Eudamus callicina*, *E. janita*, *E. pithys*, *Thymele subvirescens*, *T. grenadensis*, *Telegonus janeira*, *T. hurga*, *Nascus orima*, *N. orita*, *Telemiades megalloides*, *Cecropterus ochrilinea*, *Granius choricus*, *Lignyostola cydana*, *Pellicia bipuncta*, *P. vecina*, *P. capitans*, *Cyclosemia trigonilla*, *Eudamidas obscurior*, *Gorgythion beggoides*, *G. marginata*, *Anisochosia subpicta*, *Staphylus scoramus*, *S. anginus*, *S. minor*, *S. tadus*, *S. terreus*, *S. alicus*, *S. subapicatus*, *Heliopetes purgia*, *H. sublinea*, *Chiomara marthona*, *Thanaos austerus*, *Bulleria arpia*, *Atrytone urqua*, *A. paranensis*, *A. brasina*, *Thymelicus bahiensis*, *Augiades chalcone*, *A. anita*, *A. tania*, *A. turbis*, *A. aligula*, *Prenes diduca*, *Niconiades merendula*, *Phemiades jamaicensis*, *Cobalus fortis*, *C. rastaca*, *C. arita*, *Eutychide astiga*, *E. petrovna*, *E. barnesi*, *Thoon lugens*, *Rhinthon bomax*, *R. tanaris*, *Euroto etelka*, *E. purgis*, *E. coler*, *E. ritans*, *Phlebodes chittara*, *P. gulala*, *P. metonidia*, *P. fartuga*, *(Eonus garima*, *Phanis cumbre*, *P. tavola*, *Mucia matalma*, *Catia minaya*, *Euphyes menopis*, *Mnasalcas amatala*, *Papias tristissimus*, *P. ctyanus*, *P. sobrinus*, *Lerodea tesera*, *Vehilius almoneus*, *V. carasta*, *V. chinta*, *Megistias eorius*, *M. ranesus*, *M. polistion*, *M. monestes*, *M. miaba*, *M. chula*, *M. vanilia*, *M. gispara*, *M. vorgia*, *M. sancoya*, *M. carinna*, *M. jamaca*, *M. corescene*, *Lerema coyana*, *L. stacara*, *L. elgina*, *Padraona sartia*, *P. calcarea*, *P. radiata*, *Hesperia sucova*, *H. altama*, *H. caligula*, *H. misera*, *Callimormus diæses*, *C. verames*, *Mnestheus petrovna*, *Cymænes nux*, *C. dubitans*, *C. intermedia*, *C. occulta*, *Flaccilla coatepeca*, *F. ergola*, *Thracides orusca*, *T. bajula*, *T. biserta*, *Perichares triplaga*.

- SINDO, MICHITARO. A Review of the Japanese Species of Surf-Fishes or Embiotocidæ.—No. 1260. February 26, 1902¹ 353-359
 (See also under Jordan, David Starr.)
- . A Review of the Pediculate Fishes or Anglers of Japan.—No. 1261. February 26, 1902¹ 361-381
 (See also under Jordan, David Starr.)

¹ Date of publication.

	Page.
SNYDER, JOHN OTTERBEIN. A Review of the Discobolous Fishes of Japan.—No. 1259. February 10, 1902 ¹	343-351
(See also under Jordan, David Starr.)	
———. A Review of the Gobioid Fishes of Japan, with Descriptions of Twenty-one New Species.—No. 1244. September 25, 1901 ¹	33-132
(See also under Jordan, David Starr.)	
———. A Review of the Gymnodont Fishes of Japan.—No. 1254. November 30, 1901 ¹	229-264
(See also under Jordan, David Starr.)	
———. A Review of the Hypostomide and Lophobranchiate Fishes of Japan.—No. 1241. September 27, 1901 ¹	1-20
(See also under Jordan, David Starr.)	
———. A Review of the Labroid Fishes and Related Forms Found in the Waters of Japan.—No. 1266. May 2, 1902 ¹ ..	595-662
(See also under Jordan, David Starr.)	
———. A Review of the Salmonoid Fishes of Japan.—No. 1265. March 25, 1902 ¹	567-593
(See also under Jordan, David Starr.)	
———. A Review of the Trachinoid Fishes and their Supposed Allies Found in the Waters of Japan.—No. 1263. March 28, 1902 ¹	461-497
(See also under Jordan, David Starr.)	
STANTON, TIMOTHY W. Chondrodonta, a New Genus of Ostreiform Mollusks from the Cretaceous, with Descriptions of the Genotype and a New Species.—No. 1257. December 30, 1901 ¹	301-307
New genus: <i>Chondrodonta</i> .	
New species; <i>Chondrodonta glabra</i> .	
STARKS, EDWIN CHAPIN. A Review of the Atherine Fishes of Japan.—No. 1250. October 4, 1901 ¹	199-206
(See also under Jordan, David Starr.)	
STEARNS, ROBERT E. C. The Fossil Fresh-Water Shells of the Colorado Desert, their Distribution, Environment, and Variation.—No. 1256. December 28, 1901 ¹	271-299
STEJNEGER, LEONHARD. A New Species of Bullfrog from Florida and the Gulf Coast.—No. 1252. October 4, 1901 ¹ ..	211-215
New species: <i>Rana grylio</i> .	

¹ Date of publication.

STEJNEGER, LEONHARD. An Annotated List of Batrachians and Reptiles Collected in the Vicinity of La Guaira, Venezuela, with Descriptions of Two New Species of Snakes.—	
No. 1248. October 3, 1901 ¹	179-192
New species: <i>Phrynonax lyoni</i> , <i>Pseudoboa robinsoni</i> .	
WHITE, DAVID. Two New Species of Algæ of the Genus <i>Buthotrephis</i> , from the Upper Silurian of Indiana. No.	
1255. November 30, 1901 ¹	265-270
New species: <i>Buthotrephis divaricata</i> , <i>B. newlini</i> .	

¹ Date of publication.

LIST OF ILLUSTRATIONS.

TEXT FIGURES.

	Page.
<i>Vireosa hanae</i>	38
<i>Asterropteryx abax</i>	40
<i>Hazeus otaki</i>	51
<i>Gobius pœcilichthys</i>	53
<i>Ctenogobius abei</i>	55
<i>Ctenogobius gymnauchen</i>	59
<i>Ctenogobius hadropterus</i>	60
<i>Ctenogobius campbelli</i>	62
<i>Ctenogobius virgatus</i>	64
<i>Aboma lactipes</i>	68
<i>Aboma tsushimæ</i>	70
<i>Cryptocentrus filifer</i>	73
<i>Chænogobius macrognathos</i>	77
<i>Chloea mororana</i>	81
<i>Chloea sarchynnis</i>	83
<i>Chasmias dolichognathus</i>	85
<i>Pterogobius daimio</i>	92
<i>Pterogobius zacalles</i>	94
<i>Pterogobius zonoleucus</i>	95
<i>Suruga fundicola</i>	97
<i>Sagamia russula</i>	100
<i>Chæturichthys sciistius</i>	108
<i>Triænopogon barbatus</i>	111
<i>Tridentiger bucco</i>	116
<i>Tridentiger bifasciatus</i>	118
<i>Astrabe lactisella</i>	120
<i>Clariger cosmurus</i>	121
<i>Eutæniichthys gilli</i>	122
<i>Luciogobius guttatus</i>	124
<i>Luciogobius guttatus</i> (elongate example)	124
<i>Leucopsarion petersi</i>	126
<i>Trypauchen wakæ</i>	127
<i>Tænioides lacepedei</i>	129
Superior and inferior views of type specimen of <i>Mancalla californiensis</i> (figs. 1 and 2); corresponding portion of left humerus of <i>Lomvia troile californica</i> , all slightly enlarged (fig. 3)	134
<i>Ameiva ameiva</i> (4 figs.)	183
<i>Ameiva ameiva</i>	184
<i>Boa ruschenbergii</i> (2 figs.)	185
<i>Phrynonax lyoni</i> (3 figs.)	186
<i>Leptophis ahætulla</i> (3 figs.)	187

	Page.
<i>Clelia dolia</i> (3 figs.)	187
<i>Clelia semicincta</i> (3 figs.)	188
<i>Pseudoboa newwiedii</i> (5 figs.)	189
<i>Pseudoboa robinsoni</i> (3 figs.)	190
<i>Oxybelis acuminatus</i> (3 figs.)	191
<i>Leptognathus variegatus</i> (3 figs.)	192
<i>Atherina woodwardi</i>	200
<i>Atherina tsurugæ</i>	202
<i>Atherion elymus</i>	204
<i>Iso flos-maris</i>	205
Diagrammatic outlines of hind feet of <i>Rana catesbeiana</i> and <i>Rana grylio</i> , the former in solid lines and the latter dotted	213
<i>Spheroides stictonotus</i> (Nagasaki)	236
<i>Spheroides stictonotus</i> (Hakodate)	236
<i>Spheroides abbotti</i>	240
<i>Spheroides exascurus</i>	242
<i>Spheroides borealis</i>	245
<i>Spheroides niphobles</i>	247
<i>Spheroides chrysops</i>	249
<i>Tetraodon meleagris</i>	253
<i>Amnicola protea</i>	276
<i>Amnicola longinqua</i> (Gould)	285
<i>Fluminicola columbiana</i> (Hemphill)	285
<i>Amnicola micrococcus</i> (Pilsbry)	286
<i>Fluminicola merriami</i> (Pilsbry and Beecher)	286
<i>Anodonta californiensis</i> (Lea) somewhat reduced	287
<i>Planorbis trivolvis</i> Say (original)	296
<i>Planorbis trivolvis</i> Say distorted (original)	296
<i>Planorbis ammon</i> (Gould)	296
<i>Lethotremus auxæ</i>	345
<i>Crystallias matsushimæ</i>	350
<i>Neoditrema ransonneti</i>	356
<i>Ditrema temmincki</i>	358
<i>Lophiomus litulon</i>	365
<i>Pterophryne histrio</i>	368
<i>Pterophryne ramina</i>	370
<i>Antennarius scriptissimus</i>	374
<i>Antennarius sanguifluus</i>	375
<i>Antennarius nox</i>	376
<i>Malthopsis tiarella</i>	379
<i>Parapercis ommatura</i>	465
<i>Pteropsaron evolans</i>	471
<i>Pteropsaron verecundum</i>	472
<i>Ariscopus iburius</i>	479
<i>Gnathypops hopkinsi</i>	493
<i>Gnathypops evermanni</i>	494
<i>Stalix histrio</i>	495
<i>Oncorhynchus masou</i>	572
<i>Oncorhynchus keta</i>	573
<i>Hucho blackstoni</i>	580
<i>Plecoglossus altivelis</i> (from Formosa)	585
<i>Argentina kagoshimæ</i>	590
<i>Pomacentrus celestis</i>	603

	Page.
<i>Lepidaplois perditio</i>	618
<i>Verreo oxycephalus</i>	620
<i>Semicossyphus reticulatus</i> (very young)	622
<i>Stethojulis psacas</i>	630
<i>Stethojulis terina</i>	632
<i>Stethojulis trossula</i>	633
<i>Halicheres tremebundus</i>	640
<i>Coris aygula</i>	642
<i>Cirrhitabrbrus temmincki</i>	652
Outline map of the Andaman and Nicobar islands and neighboring regions...	753

PLATES.

	Facing page.
1-2. <i>Zalises umitengu</i>	20
3. <i>Solenostomus cyanopterus</i>	20
4. <i>Solenostomus paradoxus</i>	20
5. <i>Corythoichthys isigakius</i>	20
6. <i>Yozia wakanouræ</i>	20
7. <i>Urocampus rikuzenius</i>	20
8. <i>Hippocampus kelloggi</i>	20
9. <i>Hippocampus aterrimus</i>	20
10. <i>Hippocampus japonicus</i>	20
11. <i>Hippocampus sindonis</i>	20
12. <i>Hippocampus mohnikei</i>	20
13-14. The Felix Meteorite	198
15. Some Arachnida from Porto Rico	228
16. <i>Buthotrephis divaricata</i> . David White	270
17-18. <i>Buthotrephis newlini</i> . David White	270
19-21. Varieties of <i>Paludestrina protea</i> . Gould	300
22. American species of <i>Physa</i>	300
23-24. Variations of desert <i>Physida</i>	300
25. <i>Chondrodonta munsoni</i> . (Hill)	308
26. <i>Chondrodonta glabra</i> . Stanton	308
27. <i>Pulmonata</i> , chiefly North American	566
28. American pulmonata	566
29-30. East American gastropods	566
31-32. East American pelecypods	566
33. <i>Argonauta expansa</i> , Dall, Gulf of California	566
34-36. West American gastropods	566
37. Alaskan buccinum	566
38-39. West American gastropods	566
40. West American pelecypods	566
41-42. Andaman and Nicobar Mammals	796
43. Homes of (1) <i>Otocoris alpestris praticola</i> , Wooster, Ohio; and (2) <i>O. a. leucolæma</i> , Staked Plains, near Dimmitt, Texas	884
44. Homes of <i>Otocoris alpestris leucolæma</i> . (1) Near Stillwater, Nevada; (2) Toyabe Mountains, Nevada	884
45. Homes of (1) <i>Otocoris alpestris giraudi</i> , shore of Matagorda Bay, Texas; and (2) <i>O. a. adusta</i> , Huachuca Mountains, Arizona	884
46. Map 1. Distribution of the genus <i>Otocoris</i>	884
47. Map 2. Breeding areas of new world <i>Otocoris</i>	884
48-49. Maps 3-4. Breeding areas of old world <i>Otocoris</i>	884
50-55. Admire meteorite	914
56. Outline map of Kansas, showing meteorite finds and falls	914

A REVIEW OF THE HYPOSTOMIDE AND LOPHOBRANCHIATE FISHES OF JAPAN.

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The present paper contains a review of the Hypostomide and Lophobranchiate fishes of Japan, the families Pegasidæ, Solenostomidæ, Syngnathidæ, and Pegasidæ. It is based on specimens obtained in Japan by the authors in the summer of 1900, a series of duplicates being in the United States National Museum, and upon the collection of Japanese fishes in the United States National Museum, as well as upon specimens collected by the United States Fish Commission Steamer *Albatross*.

In this work we have had the efficient aid of Mr. Michitaro Sindo, who has carefully compared and measured all the recorded specimens.

Suborder HYPOSTOMIDES.

Body covered with bony plates, anchylosed on the trunk, movable on the tail. Gill cover formed by a large plate corresponding to the opercle, preopercle, and subopercle. One rudimentary branchiostegal. Gills four, lamellated. Ventral fins abdominal. Dorsal and anal short, of soft rays only. No pseudobranchiæ or air-bladder. This group contains a single family; fantastic little fishes of the Asiatic seas.

(ὐπό, below; στόμα, mouth.)

Family 1. PEGASIDÆ.

Body broad, much depressed, covered with bony plates; mouth small, below a prolonged snout, its margin formed by the premaxillaries; no teeth; suborbital ring well developed, forming a suture with the gill cover. Pectorals broad, very large, placed horizontally; ventrals well behind the pectorals, not far from the vent, of one or two rays, one of them very long; tail four angled, the short dorsal

and anal placed on it opposite to each other. Caudal small. Vertebrae few; no ribs. Intestinal canal short. East Indies.

a. Pectoral¹ rays equally slender, none of them spine-like; tail short, of stout rings, not tapering and flattened posteriorly..... *Zalises*. 1

1. ZALISES Jordan and Snyder, new genus

Zalises JORDAN and SNYDER, new genus (*draconis*).

The genus contains those species of *Pegasidae* which have the tail short and not attenuate and compressed toward the tip, and in which the pectoral rays are all slender and simple, none of them spine-like. East Indies. (*ζάλη*, surf; *σής*, moth.)

1. ZALISES-UMITENGU Jordan and Snyder, new species.

UMITENGU.

(Plates I, II.)

Pegasus draconis ISHIKAWA, Prel. Cat., 1897, p. 5, Boshu Kii (not of Linnæus).

Head $2\frac{1}{2}$ in length; width, posterior to pectorals, $3\frac{1}{2}$. D. 5; A. 5; P. 10; V. 2. Vent midway between front of eye and base of caudal fin. Tail of 8 rings. Trunk gibbous, the median depressed part divided by three cross-ridges; obtuse tubercles at the meeting points of the lengthwise and cross ridges of the back; nape with two deep pits; first, second, fourth, and fifth tail rings each with a compressed spine directed backward; pectoral 3 in body, as long as from tip of snout to nuchal pits; fifth pectoral ray not enlarged; snout prolonged, longer than in any other species, its length from eye 5 in body, the part before the mouth more than twice as long as broad, with a finely serrated edge on the dilated blade on each side; distance from middle of shoulder girdle to tip of snout, $2\frac{3}{4}$ in total length ($3\frac{1}{4}$ in *P. draconis*).

Color brownish, finely marked with darker. The snout and the last two caudal rays black; pectoral with fine brown dots on the rays, the outer part of the fin paler.

Seas of Japan, here described from a dried specimen, 75 millimeters long, from the province of Kii (Wakanoura), presented by the Imperial Museum of Tokyo.

Type.—No. 6518, Leland Stanford Junior University Museum.

The species closely resembles *P. draconis* of the East Indies, but differs from descriptions and figures in the longer and narrower snout, and rather longer tail. Other specimens supposed to be the same are in the collection from Boshu (near Misaki), and another from Kii.

(*Umi*, sea; *Tengu*, a long-nosed god of a humorous nature, in Japanese mythology.)

¹ The fifth pectoral ray is enlarged and spine-like in the genus *Pegasus* (*P. volitans* Linnæus). The tail is elongate, the posterior rings flattened and compressed in the genus *Parapegasis* Duméril, type, *P. natans* Bloch.

Order LOPHOBRANCHII.

THE LOPHOBRANCHS.

Gills tufted, not laminated, composed of small rounded lobes attached to the gill arches. Interclavicles well developed. Scapula suspended to the cranium by a post-temporal. Superior branchiophyls and pharyngeals, and basal branchiophyls wanting or not ossified. Mouth very small, bounded above by the premaxillaries. Post-temporal simple, coossified with the cranium; basis of the cranium simple. Pectoral fins with elevated bases. Anterior vertebræ modified, the diapophyses much expanded. Air bladder simple, without air duct. Snout produced, bearing the small toothless mouth at the end. Gill covers reduced to a large simple plate. Skin with bony plates. Muscular system little developed.

(λόφος, crest; βράγχ, gill.)

FAMILIES OF LOPHOBRANCHII.

a. Spinous and soft dorsal present; ventral fins present; gill openings wide.

SOLENOTOMIDÆ. 2

aa. Spinous dorsal fin wanting; no ventral fins; gill openings narrow.

SYNGNATHIDÆ. 3

Family 2. SOLENOTOMIDÆ.

Body compressed, the tail very short, the snout long, compressed. All parts covered with thin skin, below which is the dermal skeleton with star-like ossifications. Spinous dorsal short; soft dorsal and anal long, with elevated base; caudal long. Ventrals close together, inserted opposite spinous dorsal, each of seven rays; the fins free in the male; in the female adnate to the body forming a large pouch for the reception of the eggs. Branchiostegals 4, very thin. Intestinal canal very simple. Singular fishes of the East Indies, constituting a single genus.

2. SOLENOTOMUS Lacépède.

Solenostomus LACÉPÈDE, Hist. Nat. Poiss., V, 1803, p. 36 (*paradoxus*.)

Characters of the genus included above. (σωλήν, razor; στόμα, mouth.)

a. Snout rather stout, its median depth $4\frac{1}{2}$ in its length; color pink, everywhere with fine brown spots; first dorsal with two large ovate black spots; caudal with smaller spots *cyanopterus*. 2

aa. Snout elongate, its median depth $6\frac{1}{2}$ in its length; color brownish, irregularly mottled with orange; membrane of dorsal and caudal blotched with darker, the spots on first and second membranes of dorsal most distinct. *paradoxus*. 3

2. SOLENOSTOMUS CYANOPTERUS (Bleeker).

(Plate III.)

Solenostomus paradoxus BLEEKER, Nat. Tyds. Ned. Ind., III, p. 308, Hawaii, Ceram.—KAUP, Lophobranchiates, 1856, p. 2, Ile of France, India, New Guinea (not of Pallas).

Solenostoma cyanopteron BLEEKER, Nat. Hist. Ned. Ind., VI, p. 506, Hawaii, Ceram.—GÜNTHER, Fishes of Zanzibar, p. 137, pl. xx, figs. 2, 3, Zanzibar; Cat. Fish., VIII, 1870, p. 151, Zanzibar, Ceram, China.—DUMÉRIL, Hist. Poiss., II, 1870, p. 497, New Guinea.

Head $2\frac{1}{5}$ in length; depth 5. D. V.—20; P. 27; V. 7; A. 19; C. 15. Depth of snout at middle $4\frac{1}{2}$ in its length. Eye $6\frac{1}{4}$ in snout; dorsal spines 2 in head; ventral equal to snout or a little more; caudal a little shorter than head. Caudal peduncle shorter than base of second dorsal. Color pink, with small black dots like ink specks, scattered over head and upper part of body; eye red; fins pale, the spinous dorsal with two long black ocelli (said to be dark blue in life) on membranes of first and second spines, besides black dots, caudal with small inky spots like those on body, but more elongate, several of them drawn out into lines.

Japan to Zanzibar, occasionally northward in the Kuro Shiwo, doubtfully recorded from Hawaii. Known in Japan from a single adult female, taken at Boshu (Awa) by Dr. Kishinouye, and by him presented to Stanford University.

(κυάνεος, blue; πτερόν, fin.)

3. SOLENOSTOMUS PARADOXUS (Pallas).

(Plate IV.)

Fistularia paradoxa PALLAS, Spicilegia, VIII, p. 32, pl. iv, fig. 6, Amboyna.—SCHNEIDER, Syst. Ichth., 1807, p. 114, pl. xxx, fig. 1 (copied).

Solenostomus paradoxus LACÉPÈDE, Hist. Nat. Poiss., V, 1803, p. 36, copied.—RICHARDSON, Ichth. China, 1846, p. 203, Canton, after Chinese drawings.—DUMÉRIL, Hist. Poiss., II, 1870, p. 497, Mauritius.

Solenostoma paradoxa GÜNTHER, Cat. Fish., VIII, 1870, p. 152, Amboyna.

Head $2\frac{2}{5}$ in length; depth $5\frac{1}{4}$. D. V.—21; P. 24; V. 7; A. 22. Depth of snout at its middle $6\frac{1}{2}$ in length. Eye 7 in snout; dorsal spines $1\frac{1}{5}$ in head; ventrals a little longer than snout; caudal a little longer than head; caudal peduncle a little more than 2 in base of second dorsal.

Color light brown, with irregular oblong spots of orange brown, each with a paler center, one series of these forming an irregular stripe from eye to caudal; some darker blotches on snout and on ventrals; two dark blotches with pale center between the dorsal fins; an oblong blackish blotch on each membrane of spinous dorsal, the first two most distinct, besides numerous other blotches; soft dorsal and anal mottled; caudal clouded with blackish.

East Indies, north in the Kuro Shiwo to Japan. One fine adult female specimen presented to us by Dr. K. Kishinouye, taken at Boshu (Awa) with the preceding species. It is not certain that this species is the original *paradoxus* of Pallas, but it is obviously nearer to it than the preceding.

(παράδοξος, paradox.)

Family 3. SYNGNATHIDÆ.

THE PIPE FISHES.

Body elongate, usually slender, covered with bony plates which are firmly connected, forming a bony carapace. Head slender, the snout long, tube-like, bearing the short toothless jaws at the end. Gill openings reduced to a small aperture behind the upper part of the opercle. Tail long, prehensile or not, usually provided with a small caudal fin. Male fishes with an egg pouch, usually placed on the under side of the tail, sometimes on the abdomen, commonly formed of two folds of skin which meet on the median line. The eggs are received into this pouch and retained until sometime after hatching, when the pouch opens, permitting the young to escape. Dorsal fin single, nearly median, of soft rays only; pectorals small, or wanting; ventrals, none; anal fin minute, usually present. Small fishes, found in all warm seas, sometimes entering fresh waters.

Syngnathinæ:

- a. Tail not prehensile, usually with a caudal fin; axis of head usually in line with axis of body.
- b. Humeral bones united.
- c. Pectoral fins present; caudal present.
- d. Male with the egg pouch under the tail, formed by lateral membranes which become connected along the middle, forming a closed pouch.
- e. Dorsal fin inserted over or just before the vent.
- f. Base of the dorsal fin not raised above the level of the back.
- g. Opercle not crossed by a horizontal ridge; form slender.
- gg. Opercle crossed by a horizontal ridge; form rather robust, the keels high..... *Syngnathus*. 3.
- ff. Base of dorsal fin raised above the level of the back.
- h. Snout elongate, not serrated nor spinulose; body slender; opercle without ridge..... *Corythoichthys*. 4.
- hh. Snout short, rough or serrate above.
- i. Opercle without prominent ridge; body slender, without fleshy flaps..... *Trachyrhamphus*. 6
- ii. Opercle with a prominent ridge; body stout, with fleshy flaps; forehead elevated; nape crested..... *Halicampus*. 7.
- ee. Dorsal fin placed at a considerable distance behind the vent; pectoral and caudal fins very small; base of dorsal not elevated.

Urocampus. 8.

Hippocampine:

aa. Tail prehensile; caudal fin small; head shaped like that of a horse, placed at a large angle with axis of body; egg pouch at base of tail.

i. Body depressed; shields smooth.....*Gasterotokeus*. 9.

ii. Body compressed.

j. Occiput without coronet; shields without tubercles.

Acentromura. 10.

jj. Occiput with a narrow bony crest, surmounted by a coronet; shields with tubercles or spines...*Hippocampus*. 11.

3. SYNGNATHUS¹ Linnaeus.

Syngnathus LINNAEUS, Syst. Nat., 10th ed., 1758, p. 337 (*acus*).

Siphostoma RAFINESQUE, Caratteri Nuovi Generi, 1810, p. 18 (*pelagicus*).

Syngnathus SWAINSON, Nat. Hist. Class'n. Anim., II, 1839, p. 332 (*acus*), and of authors generally; not of Linnaeus, as first restricted by Rafinesque.

Dermatostethus GILL, Proc. Ac. Nat. Sci. Phila., 1862, p. 283 (*punctipinnis*).

Body elongate, very slender, 6 or 7 angled, not compressed, tapering into a very long tail; the dorsal keels of the trunk not continuous with those of the tail. Head slender, tapering into a long tube-like, subterete snout, which bears the very short, toothless jaws at the end. Opercle without distinct ridge. Humeral bones firmly united with the "breast ring." Body covered with a series of bony, keeled, radiated plates, arranged in linear series. Dorsal fin distinct, rather short, inserted before or after the vent, which is near the middle of the body, its base not elevated above line of back; caudal fin present, rather small; anal fin minute, close behind vent; pectorals developed, short and rather broad. Male fishes with an egg pouch along the under side of the tail, formed by two cutaneous folds, and splitting lengthwise to release the young fishes. Species very numerous, inhabiting all warm seas; abounding in bays among the seaweeds, and entering the rivers. The females in most species are deeper than the males, with more robust trunk, with longer snout, and a more distinct ventral keel.

(σύν, together; γνάθος, jaw.)

a. Snout slender, $1\frac{1}{2}$ in head; body rings about 19 + 40; dorsal rays about 37; body slender; coloration plain*schlegeli*. 4.

¹ The genus *Syngnathus* of Linnaeus, originally equivalent to the modern family of *Syngnathidae*, was first subdivided by Rafinesque in 1810. The name *Siphostoma* was given to *S. pelagicus* and its relatives, the *Syngnathus* of late writers; that of *Tiphle* to *S. typhle*, the *Siphonostoma* of late writers; while *Syngnathus* was retained for *S. aequoreus* and its relatives, the group now usually called *Nerophis*, the type of *Nerophis* being *Syngnathus ophidium* Linnaeus. This arrangement has been previously adopted by us, but it is open to two very serious objections besides the fact that it is contrary to the general usage, which makes *acus* the type of *Syngnathus*, in accordance with Swainson's arrangement. These objections are (1) that Artedi, from whom Linnaeus accepted the genus *Syngnathus*, did not know of the existence of *Syngnathus aequoreus*, and (2) the statement of Linnaeus (which we have been unable to verify), that the type of each of his genera is the "best known European or official species." *Syngnathus acus* would meet this requirement, but not *Syngnathus aequoreus*, which had not then been found in Europe.

4. SYNGNATHUS SCHLEGELI (Kaup).

YOJI-UWO (CHOPSTICK OR TOOTHPICK FISH).

Syngnathus tenuirostris SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 273, pl. cxx, fig. 5, Nagasaki (not of Rathke).

*Syngnathus schlegeli*¹ KAUP, Lophobr., 1856, p. 46, Nagasaki, after Schlegel.—DUMÉRIL, Hist. Poiss., II, 1870, p. 554.

Siphostoma schlegeli JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 350, Tokyo.

Syngnathus griseolineatus ISHIKAWA, Prel. Cat., 1897, p. 5, Kagoshima (not of Ayres).

Head $2\frac{1}{4}$ to $2\frac{3}{8}$ in trunk; head and trunk $1\frac{1}{5}$ to $1\frac{2}{5}$ in tail; rings 19 + 40 (18 to 20 + 39 to 43); dorsal rays 37 (35 to 41). Snout slender, $1\frac{1}{5}$ in head ($1\frac{2}{5}$ to $1\frac{3}{5}$). Egg pouch $1\frac{2}{3}$ to $1\frac{3}{5}$ in tail. Dorsal inserted opposite the vent, or very slightly in advance of it, covering 8 or 9 rings; depth of body $4\frac{1}{2}$ to $4\frac{3}{4}$ in head. The specimens from Aomori are more slender, the depth 5 to 6 in head.

Color light or dark brownish, frequently with small whitish dots.

Bays of Japan. Exceedingly common from Hokkaido to Nagasaki. Our many specimens from Otaru, Mororan, Hakodate, Aomori, Matsushima, Tokyo, Misaki, Wakanoura, Tsuruga, and Onomichi. Northern examples are slightly slenderer, with rather longer snout, and the number of rings more often approaches the maximum. No tangible distinction is, however, apparent. (Named for Professor Schlegel, of Leyden, the learned author of the volume on fishes in the Fauna Japonica.)

4. CORYTHOICHTHYS Kaup.

Corythoichthys KAUP, Lophobranchiates, 1856, p. 25 (*albirostris*).

This genus is composed of stout-bodied roughish pipe-fishes, in which the opercle is crossed by a horizontal ridge, and the base of the dorsal fin is not elevated. Top of head keeled; dorsal rays and body rings rather few. Tropical.

(κορύθρος, crown; ἰχθύς, fish.)

- a. Snout short, about 2 in head; body rings about 17 + 35; dorsal rays about 29; body robust with marked angles; color olive, with dark bars; sides of head with black streaks; throat with black bars.....*isigakius*. 5.

5. CORYTHOICHTHYS ISIGAKIUS Jordan and Snyder, new species.

(Plate V.)

Head $7\frac{1}{8}$ in length; $2\frac{1}{8}$ in trunk; depth $2\frac{1}{2}$ in head; snout $2\frac{1}{5}$; eye 5; dorsal 27; on 6 rings; anal 4; rings 16 + 35.

Body short, rather thick; snout very slender, about as long as rest of head, straight, subterete in form and not serrate; a crest on each

¹*Syngnathus schlegeli* Günther, from China, seems to be a different fish. D. 40; osseous rings 19 + 44 to 46; tail more than thrice length of trunk, etc.

side of head above eyes; interorbital space deeply concave; a prominent median crest of 3 lobes; opercle with a keel and a covered ridge above it; ridges of body strongly developed; neither the dorsal nor the lateral keels of body connected with dorsal keels of tail.

Dorsal inserted just posterior to anal opening; caudal contained 3 times in head.

Color light gray, with numerous diffuse dark cross bands, arranged in pairs, a black dot at edge of each plate on dorsal keel; sides of head with three black longitudinal streaks, the lowest below eye; throat below with a black median streak, behind which are three black cross bars, these bars wanting in one specimen. Described from the type, No. 6519, Leland Stanford Junior University collection, taken at Yaeyama, Ishigaki Island, Riukiu group, by Capt. Alan Owston.

Other examples from the same locality measure as follows: Head $2\frac{1}{2}$ to $2\frac{3}{5}$ in trunk; head and trunk $1\frac{1}{2}$ to $1\frac{1}{2}$ in tail; rings 16+34 to 36; D. 27 to 29. Length 110 to 150 millimeters.

(*Ishigaki*, stone-fence in Japanese.)

5. YOZIA Jordan and Snyder, new genus.

Yozia JORDAN and SNYDER, new genus (*wakanoura*).

This genus is closely allied to *Trachyrhamphus*, with which it agrees in the elevated base of the dorsal fin. The snout is, however, essentially as in *Syngnathus*, elongate and without serrations above.

(*Yoji-woo*, or toothpick fish, the Japanese name for all pipe-fishes.)

6. YOZIA WAKANOURÆ Jordan and Snyder, new species.

(Plate VI.)

?*Syngnathus coarctatus* BLEEKER, Fischf. Amboyna, 1857, p. 99, Amboyna.—

DUMÉRIL, Hist. Poiss, II, 1870, p. 569, Amboyna.

?*Syngnathus zanzibarensis* GÜNTHER, Fishes Zanzibar, 1866, p. 140, pl. xx, fig. 5, Zanzibar; Coll. Lieut. Playfair; Cat. Fish., VIII, 1870, p. 168, Zanzibar, China.

Head $2\frac{1}{2}$ in trunk; head and trunk $1\frac{1}{2}$ in tail; rings 24+59. D. 27; P. 16; C. 5. Snout more than half head, equal to distance from front of eye to posterior edge of front ring, which is very near tip of pectoral. Eye 4 in snout, 2 in postorbital space. Snout slender, its upper edge smooth. Interorbital space rather broad, concave; occiput and nape with a low, roughish median ridge, or keel, posteriorly; a low keel above opercle; trunk rather deeper than broad, slightly swollen at the middle under the elevated base of dorsal fin; depth of body $4\frac{1}{2}$ in head, 47 in total length. No spines. Vent below middle of dorsal, which stands on six rings.

Color very dark brown, with lighter and darker marblings.

One female specimen, 265 millimeters long, taken by Jordan and Snyder at Wakanoura. (Type, No. 6517, Leland Stanford Junior University Museum.) We describe it as new with some doubt, as the East Indian forms *coarctata* and *zanzibarensis* are very close to it.

It agrees very closely with Dr. Günther's account of *zanzibarensis*, notwithstanding the wide difference in locality. From Duméril's account of *coarctata* it differs in the slightly longer snout and greater nuchal keel. Duméril regards *Zanzibarensis* as identical with *Syngnathus coarctatus* from Amboyna, which may be correct. In *Y. coarctata* the rings are 22 + 59 to 63; D. 30; P. 19; occiput not keeled.

6. TRACHYRHAMPHUS Kaup.

Trachyrhamphus KAUP, Lophobranchiæ, 1856, p. 23 (*serratus* Kaup, not of Schlegel.)

This genus is very close to *Syngnathus*, from which it differs in having the base of the dorsal elevated, forming a slight protuberance on the back, and in having the upper edge of the snout serrated. Japan. (*τραχύς*, rough; *ῥάμφος*, snout.)

7. TRACHYRHAMPHUS SERRATUS (Schlegel).

Syngnathus serratus SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 272, pl. cxx, fig. 4, Nagasaki.—BLEEKER, Verh. Bat. Gen., Nalez, XXV, p. 55, Japan.—GÜNTHER, Cat. Fishes, VIII, 1870, p. 167, North China, Siam.—DUMÉRIL, Hist. Poiss., II, 1870, p. 538, Macao.—DAY, Fishes of India, p. 677, pl. CLXXXIII, fig. 4.—NYSTROM, Handl. Svensk. Vet. Akad., 1887, p. 47, Nagasaki.—DAY, Fish. Brit. India, II, p. 461.

Trachyrhamphus cultrirostris PETERS, Monatsber. Ak. Wiss. Berlin, 1869, p. 710 (said to be a young example).

Head 4 to 4½ in trunk; head and trunk 1⅓ in tail. Rings 23 or 24 + 46 to 48. Dorsal rays 26 to 28; pectoral 15 or 16; caudal 9. Snout 2½ in head. Eye 1⅓ in snout, 2 in postorbital part of head.

Snout strongly serrated above, on its basal two-thirds. Interorbital space broad, with the orbital ridges prominent, smooth; occiput and nape with a median ridge. Opercle finely radiated. Lateral line bent downward, passing into the edge of abdomen. Body scarcely deeper than broad; shields without spines. Vent nearly below middle of dorsal fin, which stands on six rings. Base of dorsal elevated; egg pouch 1⅓ to 2 in tail. Color dark brown, plates with paler edges; body faintly banded in rings; neck below with dark cross-bands. Length about 300 millimeters.

Coasts of Japan and China; rather common. Known to us from numerous specimens from Yokohama, Wakanoura, and Nagasaki; the present description from specimens from Wakanoura.

(*Serratus*, serrate.)

7. HALICAMPUS Kaup.

Halicampus KAUP, Lophobranchii, 1856, p. 22, (*conspicillatus* Kaup, not of Jenyns.)

This genus agrees with *Trachyrhamphus* in the serrated snout and in the elevated base of the dorsal fin. The snout is thin and short, set

with rows of small spines distinctly separated from the high forehead and elevated orbits. Nape and breast with comb-like crest. Dorsal fin short. Angles of body rough, furnished with fleshy tags. East Indies.

(ἄλς, sea; κάμπος, caterpillar.)

8. HALICAMPUS KOILOMATODON (Bleeker).

Halicampus conspicillatus KAUP, Lophobr., 1856, p. 22, "India," New Holland (not of Jenyns).

Halicampus grayi KAUP, Manuscript British Museum, "India," (noted by Kaup in synonymy).

Syngnathus koiomatodon BLEEKER, Act. Soc. Sci. Indo-Nederl., Japan, V. p. 10, pl. 1, fig. 1, Nagasaki. Specimen 4 inches long.

Syngnathus grayi GÜNTHER, Cat. Fish., VIII, 1870, p. 169, after Kaup's type of uncertain locality, possibly Australia.

D. 20. Rings 18 + 35. Base of dorsal fin elevated. Snout less than half head, with series of minutes spines; forehead high, its profile abruptly descending toward snout. Occiput and neck elevated into a crest; eyes large, prominent; edge of orbit rough. Opercle with radiating striae and a strong ridge bent upward; humerus with a trihedral prominence. Body not deeper than broad; shields without spines, but the ventral edges of the caudal rings forming a pouch horizontally dilated. Tail half longer than the body. Vent below middle of dorsal, which stands on four rings. Caudal very small. Egg pouch half length of tail. A deep brown spot on side of fourth body ring. (Günther.)

Coasts of Japan and southward, rare; recorded from Nagasaki by Bleeker. Not seen by us. We use the name *koiomatodon* as being prior to the adoption of *grayi* by any author, and also as its type is certainly of Japanese origin. (κοίλωμα, a hallowed place; ὄδονς, tooth.)

8. UROCAMPUS Günther.

Urocampus GÜNTHER, Cat. Fish., VIII, 1870, p. 179 (*nanus*).

Pipe-fishes, with the dorsal on the tail far behind the vent. Body elongate, compressed, with distinct longitudinal ridges; upper edge of trunk continuous with that of tail; lateral line continuous with lower caudal edge. Tail elongate, very slender, quadrangular, tapering, the last rings very small; pectoral developed. Dorsal entirely on the tail. (οὐρά, tail; κάμπος, abbreviation for Hippocampus.)

9. UROCAMPUS RIKUZENIUS Jordan and Snyder, new species.

(Plate VII.)

Head $11\frac{1}{2}$ in length, $2\frac{1}{8}$ in trunk; depth $2\frac{1}{2}$ in head; snout $2\frac{1}{4}$; eye $6\frac{1}{2}$; dorsal 16, on 5 rings; anal rings 11 + 59.

Body short; the depth anterior to anal opening about equal to length of snout; tail long, very slender, tapering to an extremely small caudal

peduncle. Snout scarcely lower than forehead; its depth equal to diameter of eye; chin with two slender barbels, slightly longer than diameter of eye. Supraorbital ridges converging to median ridge of snout; lateral ridges of snout converging above at the tips. Opercle with divergent striæ, a ridge near the middle and one along its upper edge. Occiput with a low, three-lobed, median ridge. Dorsal keels of body continuous with those of tail; lateral keels of body continuous with the ventrolateral keels of tail; median line of belly with a high, narrow keel; under part of tail with a low ridge.

Distance from dorsal to vent $5\frac{1}{2}$ times in tail; the height of dorsal about equal to depth of tail at base of fin; its base with a low ridge. Length of pectoral somewhat greater than the diameter of eye. Anal very small. Caudal minute, scarcely discernible.

Color dark brown, with white spots along the edges of each ring, these more conspicuous on tail, forming cross-bands; a dark streak along median line of belly.

A single specimen 119 millimeters long, type No. 6520 Leland Stanford Junior University Museum, taken in Matsushima Bay. It is very close to *Urocampus nanus*, described from a single female specimen from Manchuria; but that species has the rings $11 + 50$, apparently no barbels, a smooth operculum, and no anal fin, characters which, if authentic, may be of generic value.

(Rikuzen, the province in which Sendai and Matsushima are located.)

9. GASTEROTOKEUS Heckel.

Gasterotokeus HECKEL in Kaup, Lophobranchiate Fish, 1856, p. 18 (*biaculeatus*).

Syngnathoides BLEEKER, Nat. Tydskr. Ned. Ind., II, p. 259 (*blochii*).

General form of *Syngnathus*, but the tail finless and prehensile. Body depressed, the lateral line running along the margin of the abdomen. Shields smooth. Tail shorter than the rest of the body. Pectorals present. Males carrying the eggs embedded in the soft membrane of the abdomen without a pouch.

(*γαστήρ*, belly; *τόκος*, fœtus.)

10. GASTEROTOKEUS BIACULEATUS (Bloch).

Syngnathus biaculeatus BLOCH, Ichthyol., IV, 1787, p. 10, pl. cxxi, figs. 1, 2, East Indies.

Gasterotokeus biaculeatus KAUP, Lophobr., 1856, p. 19, Canton, Malayan Fishes, 1850, p. 387.—GÜNTHER, Cat. Fish., VIII, 1870, p. 194, Zanzibar, Seychelles, Singapore, Amboyna, Celebes, Philippines, China Sea, Cape York.—DUMÉRIL, Hist. Poiss., II, 1870, p. 528; Amboyna, Nias, China, Red Sea, Zanzibar, Madagascar.—GILL, Proc. Ac. Nat. Sci. Phila., 1859, p. 149; Shimoda.—ISHIKAWA, Prel. Cat., 1897, p. 4, Miyakoshima.

Gasterotoceus biaculeatus, DAY, Fish. India, pp. 6, 81, pl. CLXXIV, fig. 5; Fish. Brit. India, II, p. 467.

Syngnathus tetragonus GMELIN, Syst. Nat., I, 1788, p. 1453, after Bloch.

Syngnathoides blochii BLEEKER, Nat. Tydskr. Ned. Ind., II, p. 259.

Solegnathus blochii BLEEKER, Verh. Bat. Gen., XXV, p. 24.

Rings 18 + 45 to 55. D. 40 to 45; P. 17 to 23. Head 2 in trunk; tail shorter than trunk. A more or less distinct space on upper margin of orbit. A blunt prominence on occiput. Origin of dorsal nearly opposite vent, its base covering ten rings; usually a small barbel on mandible; adult sometimes with minute filaments along lower side of head, body, and tail. (Günther.)

Color pale green or brown, orange below, a pale spot edged with vermilion on each body-ring; lower side of head with dark markings. (Day.)

East Indies, common, rarely north to Japan; one specimen taken at Shimoda by Commodore Perry's expedition; a specimen from Miyakoshima in the Imperial Museum of Tokyo; none taken by us. (*bis*, two; *aculea*, spine.)

10. ACENTRONURA Kaup.

Acentronura KAUP, Lophobranchiatae, 1856, p. 18 (*gracilissima*).

Small slender sea-horses, without coronet. Trunk slightly compressed; tail prehensile and finless. Occiput compressed into a crest, without coronet. Shields without spines. Pectoral fins present. Edge of trunk continuous with that of tail. Egg pouch as in *Hippocampus*, at base of tail.

(α —, without; $\kappa\acute{\epsilon}\nu\tau\rho\omicron\nu$, spine; $\omicron\upsilon\rho\acute{\alpha}$, tail.)

11. ACENTRONURA GRACILISSIMA (Schlegel).

Hippocampus gracilissimus SCHLEGEL, Fauna Japonica, Poiss., p. 274, pl. cxx, fig. 6, Nagasaki.

Acentronura gracillima KAUP, Lophobr., 1856, p. 18, Nagasaki (rings 42 to 45).—GÜNTHER, Cat. Fish., VIII, 1870, p. 198, after Schlegel.—DUMÉRIL, Hist. Nat. Poiss. II, 1870, p. 527, after Schlegel.—? DAY,¹ Fish. India, p. 681, pl. CLXXVI, fig. 1; ? Fish. Brit. India, II, p. 467, Andamans.—NYSTROM, Handl. Svensk. Vet. Akad., 1887, p. 47, Nagasaki.

Head $1\frac{3}{8}$ in trunk; head and trunk $1\frac{1}{2}$ in tail; rings 13 + 45 or 46 (41 to 45, Day). D. 16; P. 12; A. 3. Snout $2\frac{3}{8}$ in head; eye $1\frac{1}{2}$ in snout; 2 in postorbital part of head. Egg pouch on 13 plates; dorsal on 4 rings; two on tail; its base with a prominent elevation. Dorsal ridges of body continuous with those of tail. Suborbital ridges very prominent, joining above the snout to form a triangular crest, then spreading out to form a triangular figure above snout. Occiput divided by a depression; body slightly thicker than head.

Color brownish, with small pale dots and dark markings; dorsal with groups of small blackish dots, forming a dark crossband.

Coast of Japan, rare; one fine male specimen 62 millimeters long obtained off Misaki in the Kuro Shiwo (*gracilimus*, very slender).

¹The two specimens from the Andamans dredged by Mr. J. Wood-Mason : re-described by Dr. Day as having 13 + 41 to 45 rings.

11. HIPPOCAMPUS Rafinesque.

SEA-HORSES.

Hippocampus RAFINESQUE, Indice d'Ittiologia Siciliana, 1810, p. 37 (*hippocampus*).

Hippocampus LEACH, Zool. Misc., 1814, p. 103 (*hippocampus*).

Body strongly compressed, the belly gibbous, tapering abruptly to a long, quadrangular, prehensile tail. Head with a distinct curved neck, placed nearly at a right angle with the direction of the body, surmounted by a compressed occipital crest, on the top of which is an angular, star-shaped coronet; top and sides of the head with spines. Physiognomy remarkably horselike, like that of a conventional "knight" at chess. Body and tail covered with bony plates, forming rings, those on the body each with six spines or tubercles, those on the tail with four. Pectoral fins present, short and broad; anal minute, usually present; dorsal fin moderate, opposite the vent. Egg pouch in the male a sac at the base of the tail, terminating near the vent. Species numerous in all warm seas. They attach themselves by their tails to seaweed and other floating substances, and are often carried to great distances by currents.

(ἵππόκαμπος, the ancient name, from ἵππος, horse; κάμπος, a wriggling sea monster, or a caterpillar.)

a. Dorsal fin long, of 15 to 18 rays.

b. Snout long, 2 to 2½ in head; coronet low.

c. Spines of neck and body low, much lower than coronet; size large.

d. Spines on body not enlarged at intervals, the rings being each similar to its neighbor; rings 11+39; color brown, with white streaks and specks.

kelloggi. 12

dd. Spines on body enlarged at intervals, the rings being not uniform; rings 11+33 to 36.

e. Snout equal to postorbital part of head; spines obtuse; color jet black, with grayish bands and spotsaterrimus. 13

ee. Snout longer than postorbital part of head; spines rather sharp; color brown, variously blotched and spottedkuda. 14

cc. Spines of neck and body very high, the longest as high as coronet; color brown, with white dots; snout with brown ringshistrix. 15

bb. Snout short, nearly 3 in head; size small.

f. Coronet very low, compressed, without filaments; spines very low, blunt; tail very slim; color brown, plain or irregularly banded.

japonicus. 16

ff. Coronet high, compressed, first laterally then longitudinally, with filaments; spines all high, many of them filamentous; color greenish gray, with darker markingssindonis. 17

aa. Dorsal fin short, of 10 to 13 rays; size small; coronet high; spines high, some of them filamentous.

g. Snout short, nearly 3 in head; coronet compressed, notched, the anterior part with long filaments. No small spine before each large supraorbital spine; body and tail banded with darkmohnikei. 18

gg. Snout long, slender, about 2½ in head, as long as postorbital part of head; coronet very high, pedunculate, not notched crosswise, its tip ending in about 6 lobes or spines; color various, usually with small light or dark dots or streakscoronatus. 19

12. HIPPOCAMPUS KELLOGGI Jordan and Snyder, new species.

Ō-UMI-UMA (GREAT SEA-HORSE).

(Plate VIII.)

Hippocampus longirostris SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 273, Nagasaki, (not of Cuvier).—GÜNTHER, Cat. Fish., VIII, 1870, p. 202, China, Formosa.—NYSTROM, Handl. Svensk. Vet. Akad., 1887, p. 47, Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 4, "Japan."

Head $1\frac{1}{2}$ in trunk; trunk 2 in tail. D. 17; P. 18. Rings 11+39, each of them essentially similar to its neighbors, none of them especially enlarged. Snout long, as long as from posterior margin of orbit to knob above gill opening. Eye about 3 in snout; supraorbital spine simple, not divided; no spine on median line before eye. Depth of body at tenth ring $1\frac{1}{2}$ times snout. Dorsal on $3\frac{1}{2}$ rings ($1\frac{1}{2}+2$). Egg pouch on 7 rings. Coronet low, about as high as eye, slanting backward and with 6 diverging blunt spines; spines of body all low and obtuse; no filaments.

Color uniform yellowish brown or leather-color; with small scattered spots and short streaks of white on sides of head and trunk, most numerous about eyes; dorsal with a dark cross shade.

Coasts of Kiusiu, not common, and known to us from a large dried example, 8 inches long, from Kagoshima.

Type.—No. 6521, Leland Stanford Junior University Museum, presented by the Imperial University, and collected by Professor Mitsukuri.

This is evidently the *Hippocampus longirostris* of Schlegel, but not of Cuvier, whose species is based on a figure of Willughby. It is close to *H. kuda*, but differs, at least, in the greater number of rings and in their uniformity. (Named for Prof. Vernon Lyman Kellogg, of Stanford University.)

13. HIPPOCAMPUS ATERRIMUS Jordan and Snyder, new species.

KURO UMI-UMA (BLACK SEA-HORSE).

(Plate IX.)

Head $1\frac{1}{2}$ in trunk; tail twice as long as trunk; D. 17. P. 16. A. 4. Rings 11+36. Egg pouch of male on 9 rings. Length of snout equal to postorbital part of head; eye 3 in snout, equal to depth of snout. Body very deep, the depth of tenth ring twice snout. Spines low and blunt, without filaments, those on first, fourth, and seventh body rings more prominent, also on first, fifth, eighth or ninth, and twelfth or thirteenth rings of tail. This character variable. Spines below dorsal not higher than others. Supraorbital spines blunt and low, pointing outward and slightly backward, notched or rather with a low

protuberance before each. A small blunt spine before eye. Coronet low, obliquely truncate, with three knob-like processes posteriorly, pointing backward. Base of dorsal elevated on $1\frac{1}{2} + 1\frac{1}{2}$ rings.

Color purplish black, almost inky; grayish marblings along the prominent rings on body and tail, forming irregular crossbars. Grayish streaks on gill covers and other parts of head; tips of spines and warts grayish; dorsal with a blackish terminal band; dark streaks along each ray; pectoral and anal with a dark cross band.

East Indies north to Japan. Known to us from six specimens, all alike, black, taken by Capt. Alan Owston, at Yaeyama, in the Ishigaki Islands, Riukiu. These are from 90 to 140 millimeters long.

Type.—No. 6516, Leland Stanford Junior University Museum.

This agrees in general with the accounts of *Hippocampus kuda* Bleeker, from the East Indies (wrongly called *H. guttulatus*), but that species has $11 + 33$ rings, and typical specimens differ greatly in color from our specimens. The original account of *H. melanospilus* by Bleeker differs equally. We may therefore provisionally regard our examples as distinct.

(*Aterrinus*, very black.)

14. HIPPOCAMPUS KUDA Bleeker.

Hippocampus kuda BLEEKER, Nat. Tyds. Ned. Ind., III, 1852, p. 82, Singapore.—

BLEEKER, Verh. Bat. Gen., XXV, p. 26.—DUMÉRIL, Hist. Nat. Poiss., II, p. 506, after Bleeker.

Hippocampus moluccensis BLEEKER, Nat. Tyds. Ned. Ind., III, 1852, p. 305, Molucca.

Hippocampus tæniopterus BLEEKER, Nat. Tyds. Ned. Ind., III, 1852, p. 306.

Hippocampus polytenia BLEEKER, Nat. Tyds. Ned. Ind., III, 1852, p. 338, Floris.

Hippocampus comes KAUP, Lophobr., 1856, p. 10 (not of Cantor).

Hippocampus punctulatus, *guttulatus* and *monieki* GÜNTHER, Fish. Zanzibar, p. 139, Zanzibar (not of authors).

Hippocampus guttulatus (part of authors) GÜNTHER, Cat. Fish., VIII, 1870, p. 202 (Zanzibar, Amboyna, Red Sea, Floris) (not of Cuvier, *H. hippocampus* from Venice).—ISHIKAWA, Prel. Cat., 1897, p. 4, Kagoshima, Miyakoshima.

Head $1\frac{1}{2}$ in trunk; trunk $1\frac{1}{2}$ in tail; rings, $11 + 35$. D. 17; P. 16. Snout as long as from eye to knob above gill opening. Eye 3 in snout; snout $1\frac{1}{2}$ in depth of body; dorsal on, $1\frac{1}{2} + 1\frac{1}{2}$ rings. Supraorbital spine simple, pointed outward and slightly backward. Body more slender than in *H. aterrinus*, the snout longer. The spines much more prominent and somewhat acute, arranged much as in *H. aterrinus*, with enlarged one on first, fourth, seventh, and eleventh body rings, and first, fifth, sixth, ninth, twelfth, and fifteenth tail rings; no filaments.

Color light-brown, with gray streaks and blotches; white lines radiating from eye and white streaks on snout and side of neck; the pale markings on side of body in our specimen suggest coralline patches; dorsal with a dark cross-shade.

East Indies; widely distributed, north to Riu Kiu Islands. This description is from a specimen 115 millimeters long, from Ishigaki, Yaeyama Island, Riukiu. We identify this specimen with *H. kuda* with some doubt, and we are not sure of the synonymy of the species, even if the identification be accepted. According to Dr. Day, the number of rings in *H. kuda* (*guttulatus*) is $11 + 33$. The relations of this species to the other large-sized and long-nosed sea horses are still obscure.

(*Kuda*, a tube, in Japanese.)

15. HIPPOCAMPUS HISTRIX Kaup.

Hippocampus histrix KAUP, Lophobr., 1856, p. 17, pl. II, fig. 5, Japan.

Hippocampus hystrix GÜNTHER, Cat. Fish., VIII, 1870, p. 206, Zanzibar.—
DUMÉNIL, Hist. Nat. Poiss., II, 1870, p. 514, Nagasaki, Ile of Reunion.

Dorsal rays 17 or 18. Snout thin, elongate, longer than rest of head, as long as distance from front of orbit to first nuchal spine; all the tubercles of body developed into long, slender, acute spines, those on certain rings longer than the others. Color pale, with numerous white dots; snout with broad dark rings; each spine black at tip. Length, $2\frac{1}{2}$ inches. (Günther, Zanzibar specimens.) Kaup does not count the fin rays, and says that his specimen is uniformly colored.

In his figure the spines along the back are higher than the coronet, and $2\frac{1}{2}$ to $3\frac{1}{2}$ in length of snout; the coronet is very low, bifurcate at tip; spines on back of tail especially prominent; body slender.

East Indies; a few specimens known, recorded from Japan, Zanzibar and the Isle of Reunion, not seen by us.

(*Hystrix*, porcupine.)

16. HIPPOCAMPUS JAPONICUS Kaup.

KITA-NO UMI-UMA (NORTHERN SEA HORSE).

(Plate X.)

Hippocampus japonicus KAUP, Lophobr., 1856, p. 7, Nagasaki, Leyden Museum.—
DUMÉNIL, Hist. Poiss., II, 1870, p. 505, same type.

Head $1\frac{2}{3}$ ($1\frac{1}{2}$ to $1\frac{3}{4}$) in trunk; trunk 2 to $2\frac{1}{2}$ in tail; D. 16 or 17; P. 11 or 12. Rings $11 + 39$. Snout $2\frac{2}{3}$ to 3 in head. Eye $1\frac{1}{2}$ to 2 in snout. Snout 2 to $2\frac{1}{2}$ in depth of body. Coronet from gill-opening, $1\frac{1}{4}$ to $1\frac{1}{2}$ in snout. Dorsal covering $2 + 1\frac{1}{2}$ rings. Prominent rings 1, 4, 7, 11 on the body; 5, 10, 15 on tail, these subject to considerable variation.

The body moderately deep, the tail very slim, the snout very short. Spines on body blunt and short. Coronet low, compressed, keel-like; supraocular spine low; no spine before eye. Spines at base of dorsal little enlarged. Length $2\frac{1}{2}$ inches.

Color various. A specimen from Tokyo is light brown, with two black cross bands on body and four of different widths on tail; head

mottled; a dark bar at base of snout. Dorsal usually dusky with a pale median band. A specimen from Hakodate is leather brown, with dark markings on head; middle line of breast black; tail dark. A specimen from Onomichi is nearly uniform livid gray. One from Hakodate has almost no coronet.

The combination of low, keel-like coronet with the short snout and 16 dorsal rays at once distinguishes the species. Our numerous specimens are from Hakodate, Matsushima, Tokyo, Onomichi, and Wakanoura. The range of the species is farther to the northward than the others.

17. *HIPPOCAMPUS SINDONIS* Jordan and Snyder, new species.

(Plate XI.)

Head $1\frac{1}{3}$ in trunk; trunk 2 in tail. D. 15; P. 14. Rings 10 + 37. Snout short, its length $2\frac{1}{2}$ times in head. Eye $1\frac{1}{4}$ times in snout. Depth of trunk $1\frac{1}{2}$ times snout. Coronet high, almost as high as the length of snout. It is laterally compressed up to its middle, ends anteriorly in an acute triangular spine with a filament, also terminates posteriorly in an acute spine, without filament. From the middle up it is longitudinally compressed, giving rise to a laterally expanded, fan-like process, with five spines, pointing upward; the one next to each end with a filament. Supraorbital spines very prominent, with filaments and a distinct minor spine in the immediate front of each, all pointing anteriorly, large ones slightly outward as well; a well-marked spine on median line before eyes. Tubercles on body rather high, those in first, fourth, seventh, and tenth body rings, and second, fourth, sixth, eighth, tenth, and thirteenth tail rings enlarged and with filaments. The raised dorsal fin on $1\frac{1}{2} + \frac{1}{2}$ rings. Pectorals very much developed.

Color greenish gray, with irregular darker markings on body and tail. Head mottled with dark gray on greenish ground, interspersed with light cross bars and streaks. Middle line of belly black. Fins dusky, unmarked except the dorsal, which has a dark band longitudinally. Egg pouch occupies seven rings, greenish and covered with prickle-like processes.

This species is known from one small specimen, an adult male 38 millimeters long, type No. 47930 U. S. National Museum, dredged by the U. S. Fish Commission steamer *Albatross* in Totomi Bay, off Hamamatsu, in the province of Totomi, Japan. The species is allied to *H. mohnikei*, but differs in the form of coronet, the number of fin rays, and slimness of body, and also its size, which is much smaller than the smallest specimen of *mohnikei*.

(Named for Michitaro Sindo, late of Yamaguchi, assistant curator of fishes in Stanford University.)

18. HIPPOCAMPUS MOHNIKEI Bleeker.

(Plate XII.)

TATSU-NO-OTOSIGO (DRAGON'S CHILD).

Hippocampus brevirostris SCHLEGEL, Fauna Japonica, p. 274, Nagasaki, not of Cuvier (*H. hippocampus*).

Hippocampus mohnikei BLEEKER, Verh. Ak. Met. Amst., 1851, pp. 7, 16, Kamino-seki Island, Prov. Suwo, Inland Sea.—KAUP, Lophobr., 1856, p. 8, Nagasaki, coll. Von Siebold.—GÜNTHER, Cat. Fishes, VIII, p. 206, after Bleeker.—DUMÉRIL, Hist. Nat. Poiss., II, 1870, p. 521, after Bleeker.—ISHIKAWA, Prel. Cat., 1897, p. 4, Boshu (Awa), near Tokyo.

Head $1\frac{1}{2}$ in trunk; trunk $1\frac{1}{2}$ to 2 in tail. D. 11-13; P. 10-12. Rings 10 + 36 or 37. Egg pouch on 6 rings. Eye $2\frac{1}{3}$ in snout. Snout $2\frac{1}{4}$ in head, 2 to $2\frac{1}{3}$ in depth of body, as long as from front of orbit to postorbital spine. Coronet 2 to $2\frac{1}{4}$ in snout; dorsal on $2\frac{1}{3}$ rings. First, fourth, seventh, and tenth body rings, and third, sixth, tenth, and thirteenth tail rings prominent.

Coronet high, compressed, divided; the anterior part with long filaments, the posterior with 5 or 6 spines. Supraorbital spines simple, high, each with a long filament, and with or without a small spine before the large one; a median spine before eye. Snout short, thick. Spines on body high, the long ones on back and tail each with a long filament.

Color gray, with 8 to 10 faint, dark cross bands; snout pale; dorsal with a dark band and a pale edge. Young with the band more distinct. Southern Japan, north to Tokyo. Known to us from two specimens from Misaki, about 83 and 55 millimeters long; and one, 90 millimeters long, from Enoura on Suruga Bay, presented by the Imperial University. This latter and the smaller one from Misaki are both light brown in color, with the dorsal bands, body bands, and median line on belly colored dark brown. In size the small Misaki specimen is less than two-thirds of the Enoura specimen, although both are full-grown adults.

The species is allied to *H. coronatus*, but has the snout much shorter, and the coronet lower and of a peculiar form.

(Named for the discoverer, Dr. O. G. B. Mohnike.)

19. HIPPOCAMPUS CORONATUS Schlegel.

TSUNO-UMIUMA (HORNED SEA-HORSE).

Hippocampus coronatus SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 274, pl. cxx, fig. 8, Nagasaki.—KAUP, Lophobr., 1856, p. 16, Nagasaki.—GÜNTHER, Cat. Fish., VIII, 1870, p. 205, after Schlegel.—DUMÉRIL, Hist. Poiss., II, 1870, p. 520, after Schlegel.—ISHIKAWA, Prel. Cat., 1897, p. 4, Tokyo.

Head $1\frac{1}{2}$ to $1\frac{2}{3}$ in trunk; trunk $1\frac{2}{5}$ to 2 in tail; D. 13 or 14; P. 11. Rings 10 + 38 to 40. Snout slender, about as long as postorbital part

of head; eye 3 in snout; snout $1\frac{1}{2}$ to $1\frac{3}{4}$ in greatest depth of body. Coronet very high, pedunculate, not divided into two parts at the top; varying in form, its length from gill opening about equal to snout; its tip usually with six lobes or spines. Spines of head and body prominent, the coronet usually with a long filament; other spines occasionally prominent. First, fourth, and tenth body rings prominent, and usually the fourth, sixth, tenth, fourteenth, and sixteenth of the tail. Spines at base of dorsal especially long and prominent. Dorsal short, inserted on $1\frac{1}{2} + 1 = 2\frac{1}{2}$ rings; egg pouch on 7 rings.

Color various, usually light brown with dark dots and mottlings, sometimes with pale dots and streaks, sometimes with dark brown streaks, the ground color sometimes almost black; usually light or dark streaks on opercle. Dorsal generally with a blackish band and pale edge, sometimes streaked like the body.

Coasts of Japan, very common, in clear waters near shore. A small, slender sea-horse, varying considerably in form, and much in coloration, but always readily known by the very high coronet, the sculpture of which is subject to great variation. Our many specimens, 90 to 115 millimeters long, are from Matsushima, Tokyo, Misaki, Onomichi, and Wakanoura. They would seem at first glance to compose five or six different species.

(*Coronatus*, crowned.)

RECAPITULATION.

Suborder HYPOSTOMIDES.

Family 1. PEGASIDÆ.

1. *Zalises* Jordan and Snyder.

1. *umitengu* Jordan and Snyder Wakanoura.

Order LOPHOBRANCHII.

Family 2. SOLENOSTOMIDÆ.

2. *Solenostomus* Lacépède.

2. *cyanopterus* (Bleeker); Awa.

3. *paradoxus* (Pallas); Awa.

Family 3. SYNGNATHIDÆ.

3. *Syngnathus* Linnæus.

4. *schlegeli* (Kaup); Otaru, Mororan, Hakodate, Aomori, Matsushima, Tokyo, Misaki, Wakanoura, Tsuruga, Onomichi.

4. *Corythoichthys* Kaup.

5. *isigakius* Jordan and Snyder; Ishigaki Island.

5. *Yozia* Jordan and Snyder.

6. *wakanouræ* Jordan and Snyder; Wakanoura.

6. *Trachyrhamphus* Kaup.

7. *serratus* (Schlegel); Yokohama, Wakanoura, Nagasaki.

7. *Halicampus* Kaup.

8. *koilomatodon* (Bleeker).

8. *Urocampus* Günther.

9. *rikuzenius* Jordan and Snyder; Matsushima.

9. *Gosterotokeus* Heckel.

10. *biaculeatus* (Bloch).

10. *Acentronura* Kaup.

11. *gracilissima* (Schlegel); Misaki.

11. *Hippocampus* Rafinesque.

12. *kelloggi* Jordan and Snyder; Kagoshima.

13. *atterimus* Jordan and Snyder; Ishigaki Islands.

14. *kuda* Bleeker; Ishigaki Islands.

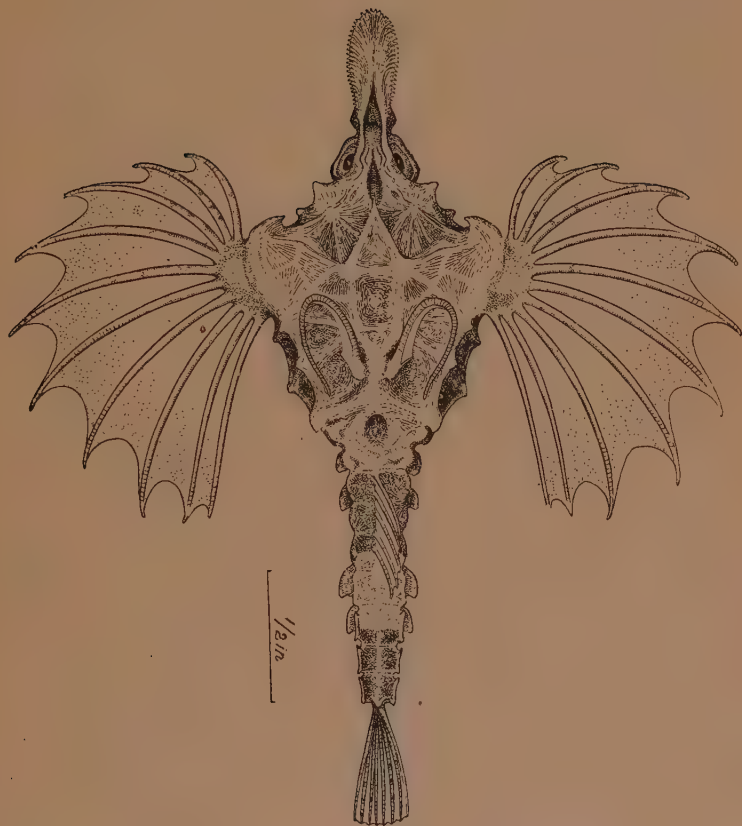
15. *histrix* Kaup.

16. *japonicus* Kaup; Hakodate, Matsushima, Tokyo, Onomichi, Wakanoura.

17. *sinonis* Jordan and Snyder; Hamamatsu.

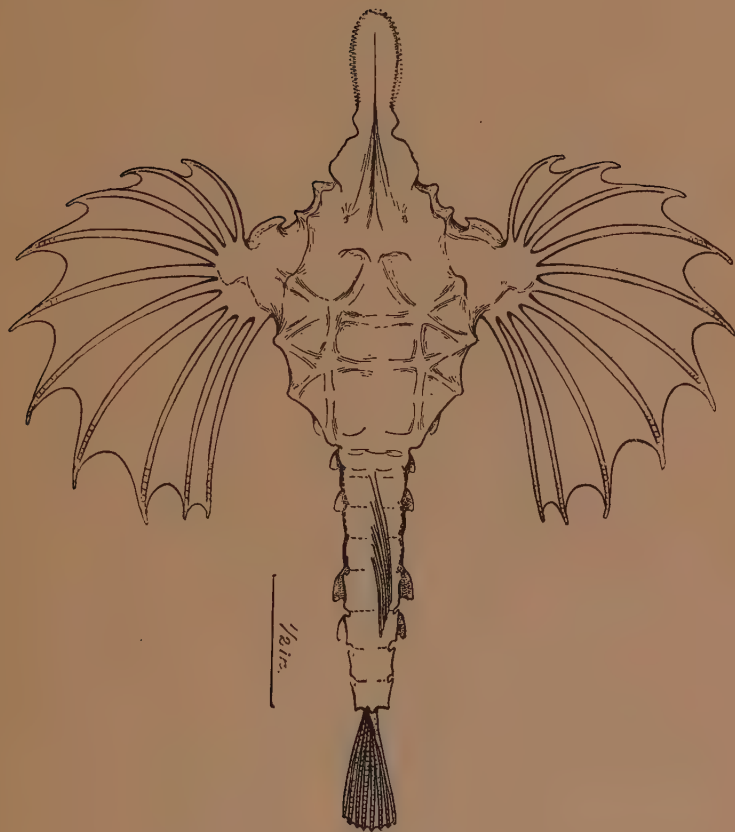
18. *mohnikei* Bleeker; Misaki, Enoura.

19. *coronatus* Schlegel; Matsushima, Tokyo, Misaki, Onomichi, Wakanoura.



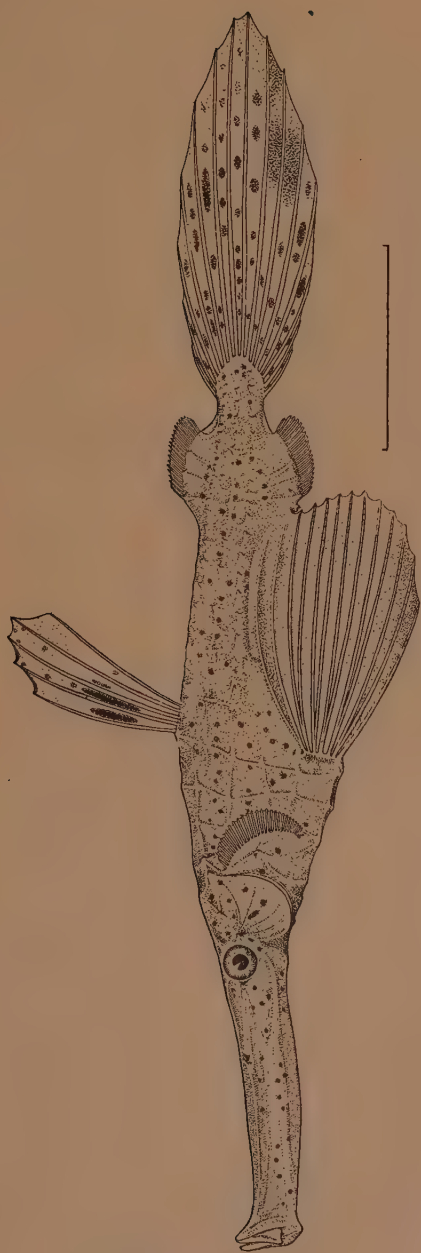
ZALISES UNITENGU.

FOR EXPLANATION OF PLATE SEE PAGE 2.



ZALISES UNITENGU.

FOR EXPLANATION OF PLATE SEE PAGE 2.

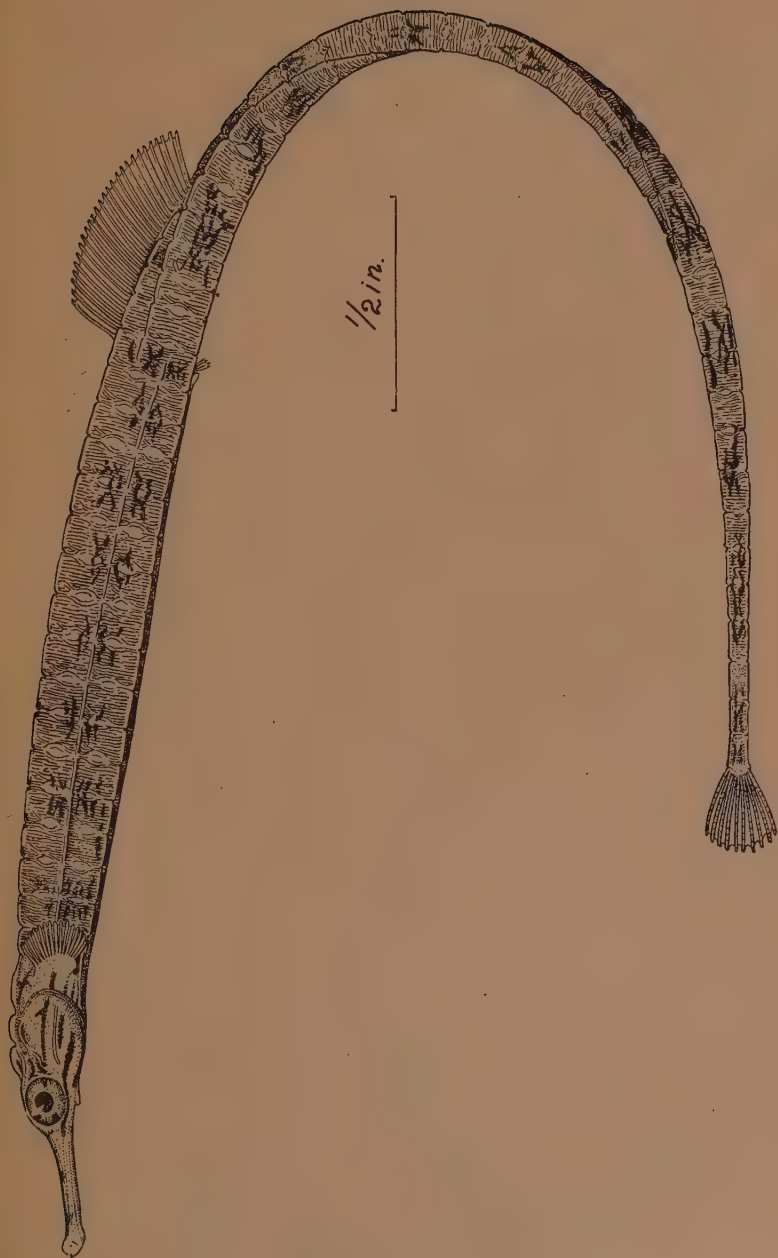


SOLENOTOMUS CYANOPTERUS
FOR EXPLANATION OF PLATE SEE PAGE 4.



SOLENOTOMUS PARADOXUS.

FOR EXPLANATION OF PLATE SEE PAGE 4.



CORYTHOICHTHYS ISIGAKIUS,
FOR EXPLANATION OF PLATE SEE PAGE 7.



YOZIA WAKANOURÆ.

FOR EXPLANATION OF PLATE SEE PAGE 8.



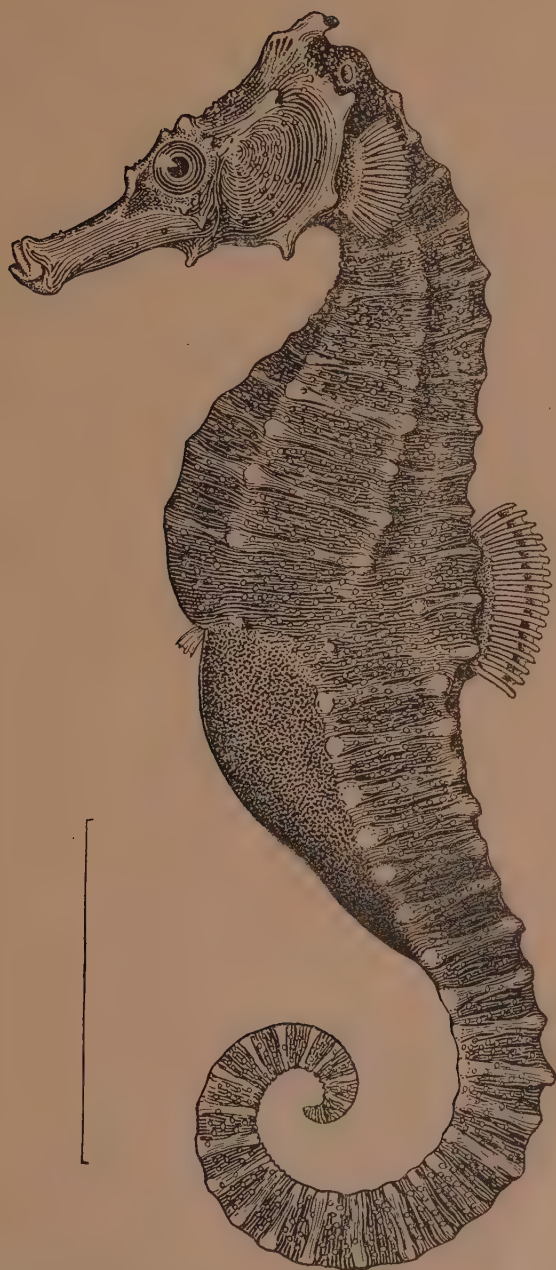
UROCAMPUS RIKUZENIUS.

FOR EXPLANATION OF PLATE SEE PAGE 10.



HIPPOCAMPUS KELLOGGI.

FOR EXPLANATION OF PLATE SEE PAGE 14.



HIPPOCAMPUS ATERRIMUS.

FOR EXPLANATION OF PLATE SEE PAGE 14.



HIPPOCAMPUS JAPONICUS.

FOR EXPLANATION OF PLATE SEE PAGE 16.





HIPPOCAMPUS SINDONIS.

FOR EXPLANATION OF PLATE SEE PAGE 17.



HIPPOCAMPUS MOHNIKEI.

FOR EXPLANATION OF PLATE SEE PAGE 18.

LIST OF THE MYRIAPOD FAMILY LITHOBIIDÆ OF SALT LAKE COUNTY, UTAH, WITH DESCRIPTIONS OF FIVE NEW SPECIES.

By RALPH V. CHAMBERLIN,
Of the Latter-day Saints' College, Salt Lake City.

The five new species of *Lithobius* described in this paper are based upon material in collections made by the author from June to October, 1900, and in February, March, and April, 1901. Types of these new species have been deposited in the United States National Museum. Inasmuch as nothing upon the Myriapoda of Utah has been heretofore published, some notes are also given on the other species of the Lithobiidæ found within the limits of Salt Lake County.

ANALYTICAL KEY TO THE SPECIES OF LITHOBIUS DESCRIBED.

- A. Posterior angles of none of the dorsal plates produced.
 - a₁. Anal feet each armed with a single claw.
 - b₁. Coxal pores in several series, round.
 - c. Posterior coxæ armed beneath with a stout spine.
 - d. Antennæ long, articles 20; prosternal teeth, 9-9; spines of anal legs, 1, 3, 2, 1. *bipunctatus* Wood 1
 - b₂. Coxal pores in a single series, round.
 - c. Posterior coxæ unarmed beneath.
 - d₁. Articles of the antennæ, 20-22; coxal pores, 2, 2, 2, 2-2, 3, 3, 3; ocelli, 5-11; spines of anal legs, 1, 3, 2, 0; length, 7.5-11 mm. *utahensis*, new species 2
 - d₂. Articles of the antennæ, 20-23; coxal pores, 3, 4, 4, 3-3, 4, 4, 4; ocelli, 18-22; spines of anal legs, 1, 3, 2, 0; length, 13-15.8 mm. *collinum*, new species 3
 - a₂. Anal feet each armed with two claws.
 - b. Coxal pores in a single series, round.
 - c. Posterior coxæ unarmed beneath.
 - d. Articles of the antennæ, 20-25; coxal pores, 4, 5, 5, 4-5, 6, 6, 6; spines of the first legs, 1, 3, 2; of the anal, 1, 3, 2, 0; length, 12.2-13.8 mm. *socius*, new species 4
- B. Posterior angles of the ninth, eleventh, and thirteenth dorsal plates produced.
 - a₁. Coxal pores in several series, round; anal feet with a single claw.
 - b. Posterior coxæ armed beneath with a stout spine.
 - c. Antennæ long, articles 20; prosternal teeth, 12 to 18; spines of anal legs, 1, 3, 2, 1. *canti* Wood 5

- a*₂. Coxal pores in a single series, transverse; anal feet with a single claw.
- b*. Posterior coxæ unarmed beneath.
- c*. Articles of the antennæ, 33-48; prosternal teeth, 10 to 14; spines of anal legs, 1, 3, 3, 2 *forficatus* (Linnæus) 6
- a*₃. Coxal pores in a single series, round.
- b*. Posterior coxæ unarmed beneath.
- c*₁. Articles of the antennæ, 20; coxal pores, 3, 3, 3, 3; ocelli, 10; prosternal teeth, 5-5; length, 7.5-9 mm. *intermontanus*, new species 7
- c*₂. Articles of the antennæ, 28-32; coxal pores, 2, 3, 3, 2-3, 4, 4, 4; spines of first legs, 0, 0, 1; of anal, 1, 3, 3, 0-1, 3, 1, 0; length, 7-8.5 mm. *purpureus*, new species 8

1. LITHOBIUS BIPUNCTATUS Wood.

It has seemed well to include a description of this form, as it has not before been rediscovered or redescribed since Wood established the species in 1863.

Description.—Color, dark amber brown, the head lighter; legs mostly pale, posterior pairs and the antennæ somewhat darker. Antennæ, length, 16.5 mm, reaching to the eighth segment; pilose, articles 20. Ocelli, 18-22, in 7 series. Prosternal teeth, 9-9, black; the space between the second and third from the outer side much wider than between the other teeth. Spines of the legs, first, 2, 3, 1; penult, 1, 3, 3, 2-1, 3, 3, 3; anal, 1, 3, 2, 1. The anal legs are long and slender, not at all crassate. Coxal pores round or somewhat oval; arranged in 3-4 series in an oval patch. Genital forceps, claw long and pointed, tripartite, the middle lobe largest, the outer lobe nearer apex than the inner; basal spines 3-3, the outermost largest. Length of body, 28.7 mm; width of tenth dorsal plate, 3.9 mm; length of the anal legs, 16 mm.

Habitat.—Emigration Canyon, near the mouth. A number of specimens were taken in the dirt-filled crevices of the rock in a limestone quarry.

2. LITHOBIUS UTAHENSIS, new species.

Diagnosis.—This species is related to *Lithobius obesus* Stuxberg, but the claw of the genital forceps is tripartite, the spines of the anal legs are 1, 3, 2, 0, and the size is always smaller. It is also near *Lithobius eigenmanni* Bollman, from which it is distinguished by the coxal pores, which are small and less in number, by the number of spines of the anal legs, and by the ocelli, which are fewer.

Description.—Color yellow to brown, legs and antennæ paler. Antennæ, length 2.6-3 mm.; hirsute; articles 20-22, gradually decreasing in length from the first few to the end. Ocelli 5-11, but mostly 5-8, arranged in 4-5 series. Prosternal teeth 2-2, small, pale. Spines of the first legs 1, 2, 1-2, 3, 2; of the penult 1, 3, 3, 1-1, 3, 3, 2; of the anal 1, 3, 2, 0. The posterior coxæ laterally armed. The coxal pores small, round, 2, 2, 2, 2-2, 3, 3, 3. Genital forceps, claw tripartite, the middle lobe longest, the outer smallest; basal spines 2-2, rather stout, the outer usually thickened upward and somewhat bifid at apex.

Anal legs of male, tibia swollen and excavated within near its anterior joint, at which it, together with the femur, is produced inward into a lobe which is often very conspicuous. Length of the body 7.5–11 mm.; width 0.8–1.2 mm.; length of the anal legs 2.5–3 mm.

Habitat.—Common along all mountain streams, loving particularly the damp beds of decaying leaves and vegetable loam.

Type.—U.S.N.M., No. 782; collected in Neff's Canyon, Salt Lake County, Utah, July 15, 1900.

3. LITHOBIUS COLLIUM, new species.

Diagnosis.—Joints of the antennæ 20–23; ocelli 18–22, in 7 vertical series; spines of anal legs 1, 3, 2, 0; claw of genital forceps wide, lobes short, the middle one not much longest.

Description.—Color brown, head and dorsal plates with a tendency to red brown, which may be strong; antennæ and legs yellow or light brown. Head smooth. Antennæ, length 4–5.5 mm.; articles 20–23, gradually decreasing in length toward the end; pilose. Ocelli 18–22, in 7 nearly vertical series. Prosternal teeth 2–2, small. Spines of the first legs 1, 3, 2–2, 3, 2; penult 1, 3, 3, 2; anal 1, 3, 2, 0. Posterior coxæ laterally armed. Coxal pores 3, 4, 4, 3–3, 4, 4, 4, small, round. Genital forceps, claw rather long, wide, tripartite, the lobes short and rounded, the middle one but little longer than the lateral, or the claw subentire; basal spines 2–2, moderate, the outer spine on each side somewhat stouter. Length of body 13–15.8 mm.; width 1.6–1.7 mm.; length of the anal legs 4–5 mm.

Habitat.—Common over the foothills about Salt Lake City during the spring and autumn months.

Type.—U.S.N.M., No. 783.

4. LITHOBIUS SOCIUS, new species.

Diagnosis.—This species is to be separated by the following points: Coxal pores 4, 5, 5, 4–5, 6, 6, 5; articles of the antennæ 20–25; spines of the anal legs always 1, 3, 2, 0; characters of genital forceps; and size, 12.2–13.8 mm.

Description.—Color, head and posterior dorsal plates brown; other dorsal plates mostly dark brown to brownish black; antennæ and legs yellow to light brown. Head smooth, wider than long. Antennæ, length 5–5.7 mm., but mostly near the lesser limit; articles 20–25; first 7–12 joints long, others short; pilose. Ocelli 16–22, arranged in 6–8 series. Prosternal teeth variable in size and number, 0–0 to 2–2 and 3–3 (as common) or even to 5–5. Spines of the legs, first 1, 3, 2; penult 1, 3, 3, 2; last 1, 3, 2, 1. Posterior coxæ laterally armed. Coxal pores 4, 5, 5, 4–5, 6, 6, 5; large, subcircular, or in part transverse. Genital forceps, claw normally tripartite but by obliteration of the outer lobe often bipartite or subentire, and on the other hand

sometimes possessing as many as 6 small lobes or crenulations; basal spines 2—2, short, stout, usually widening upward to the middle and conical or pointed above. The head in the male is proportionately wider than in the female. The inner claw of the anal feet is also larger in the male, being often indistinct in the female. Length of the body 12.2–13.8 mm.; width 1.8–2 mm.; length of the anal legs 5–5.6 mm., mostly near the lesser limit.

Habitat.—With the preceding form over the foothills about Salt Lake City, but less abundant.

Type.—U.S.N.M., No. 784.

5. LITHOBIUS XANTI Wood.

Habitat.—Common along all mountain streams. This species and *Lithobius utahensis* are the forms by far most abundant in the canyons.

6. LITHOBIUS FORFICATUS (Linnaeus).

Habitat.—In and about Salt Lake City, where it is much the commonest species, but not found in the mountains.

The antennæ are most commonly either 36 or 39 jointed.

7. LITHOBIUS INTERMONTANUS, new species.

Diagnosis.—Separated from other species previously described by the following points: Posterior coxæ unarmed; articles of the antennæ 20; prosternal teeth 5—5; coxal pores 3, 3, 3, 3, round; ocelli 10, in 6 series; length 7.5–9 mm.

Description.—Color, chestnut brown; antennæ and legs paler. Antennæ, length 2.65–2.75 mm.; articles 20; sparsely hirsute at base, elsewhere nearly glabrous. Ocelli 10, arranged in 6 series in a linear patch. Prosternal teeth 5—5. Spines of the first legs 2, 3, 2. Last tarsal joints of the first pairs of legs more densely hirsute beneath than the inner ones. Posterior coxæ unarmed. Coxal pores 3, 3, 3, 3, round. Length of the body 7.5–9 mm.; width 0.8–1 mm.

Habitat.—Branch of Mill Creek Canyon. The eight specimens obtained have all lost the posterior pairs of legs.

Type.—U.S.N.M., No. 785.

8. LITHOBIUS PURPUREUS, new species.

Diagnosis.—Anal feet each armed with two claws; articles of the antennæ 28–32; spines of the first legs 0, 0, 1, of the last 1, 3, 3, 0 or 1, 3, 1, 0; coxal pores 2, 3, 3, 2–3, 4, 4, 4; length 7–8.5 mm.

Description.—Color, dark purple brown, the purple tint often conspicuous and unmixed; head and legs yellowish brown, the tarsal joints of the last pairs of legs commonly lighter; antennæ dark, yellow or rufous at ends. Antennæ, length 2.3–3 mm.; articles, except

the first few, short or very short. Ocelli 12–13, in 5–6 series. Prosternal teeth, normally 2–2, rather large, pale, but occasionally 4–4. Spines of the first legs 0, 0, 1; of the penult 1, 3, 3, 1; of the anal 1, 3, 3, 0, or less commonly 1, 3, 1, 0. Posterior coxæ armed laterally with a small, indistinct spine. Coxal pores 2, 3, 3, 2–3, 4, 4, 4, small or moderate. Genital forceps, claw rather long, tripartite, lobes pointed, the middle longest, the outer smallest, often nearer base and inconspicuous; basal spines 2–2, short and stout, widest at the middle, the outer largest. Length of the body 7–8.5 mm.; width 1–1.2 mm. Length of the anal legs 3–3.3 mm.

Habitat.—Not very common under sticks, boards, and logs laid on fine, loose soil in and near growths of willows on the banks of the Jordan River, Salt Lake City.

Types.—U.S.N.M., No. 786.

9. *HENICOPS FULVICORNIS* Meinert.

Habitat.—Not uncommon in several canyons at middle and upper elevations in very damp and cool places. Many were found under the bark and between the fibers of decaying logs, and two were taken under the body of a dead skunk, which lay at a considerable distance from water.

This species, first discovered in Europe, has been heretofore reported from the United States as occurring in New York (Mount Lebanon), Arkansas (Little Rock), and Minnesota (Winona).

NEW DIPTERA FROM SOUTHERN AFRICA.

By D. W. COQUILLETT,

Custodian, Section of Diptera.

During a visit to the United States National Museum last year, Mr. Charles P. Lounsbury, the government entomologist of Cape Colony, Africa, brought with him a small but very interesting collection of Diptera which he wished to have identified, permitting the retention of specimens representing species new to the Museum collection and requesting that the new forms be duly named and described. As this task has now been completed, the descriptions are offered herewith.

SIMULIUM NIGRITARSIS, new species.

Black, the bases of the antennæ, humeri, halteres, front coxæ, femora except apices of the middle and hind ones, and the tibiæ except their apices, yellow; front femora and their tibiæ sometimes wholly yellow; usually a yellow spot below the humeri; hairs of head and body pale yellow; wings hyaline, the costa, first three veins and first section of the fourth robust, yellowish, the others nearly transparent; length 2.5 to 3 mm. Six female specimens. Paratypes have been returned to Mr. Lounsbury.

Habitat.—Cape Colony, Africa.

Type.—Cat. No. 5785, U.S.N.M.

DACUS LOUNSBURYII, new species.

Head yellow, occiput, except the upper and lateral margins, reddish brown, frontal vitta except its lower end reddish brown, an ocellar spot, one near center of front and one on the lunule, blackish, a row of four blackish dots along each orbit; a broad reddish stripe in middle of face, a black spot on either side near its middle, an oblique reddish line near each orbit, and a large black spot below each eye; antennæ nearly twice as long as the head, brownish red, the extreme base yellow, the third joint black; palpi and proboscis brownish red, apex of the latter largely yellow; body reddish brown, indistinctly

marked with blackish, mesonotum marked behind the suture with three yellow vittae, a yellow fascia extends along the suture, crosses the mesopleura and encroaches on the sternopleura; a spot on the hypopleura, hind margin of the scutellum and of the second abdominal segment laterally yellow; abdomen three times as long as wide, the third segment in the male bearing a row of black bristles extending from the venter half way to the middle of the dorsum, situated a short distance in front of the hind margin; wings hyaline, a brownish band along the costa, filling apex of subcostal cell beyond auxiliary vein, the whole of the marginal and submarginal cells, apical three-fourths of the first posterior and upper edge of the second posterior cell, faintest in basal portion of submarginal cell and darkest in the posterior cells, that in first posterior cell sometimes having a subhyaline median streak; anal cell filled with yellow and brown, its lobe and the vein extending beyond its apex bordered with brown; base of first basal cell to forking of second and third veins yellowish; legs reddish brown, first tarsal joint except apex, and broad bases of hind femora, white; halteres whitish, bases of the stems reddish brown; basal segment of ovipositor of female greatly flattened, shorter than the preceding abdominal segment; length 11 mm. Three males and seven females. Paratypes returned to Mr. Lounsbury, for whom this fine, large species is named.

Habitat.—Capetown and Wynberg, Cape Colony, Africa.

Type.—Cat. No. 5786, U.S.N.M.

DACUS BREVIS, new species.

Head yellow, frontal vitta sometimes tinged in places with reddish yellow, the occiput except along the eyes yellowish brown, a dark brown spot above center of front, a small black spot on the ocelli, three along each orbit, one on the frontal lunule, and one on either side of center of face, a brown spot below each eye; antennae shorter than the head, yellowish brown, becoming dark brown at the apex, arista black, the base yellowish, proboscis and palpi brownish yellow; body reddish brown, mesonotum and abdomen with a mediodorsal black line, and sometimes with blackish markings; humeri, a stripe along the thoracic suture crossing the mesopleura and encroaching on the sternopleura, a rounded spot on the hypopleura, and the scutellum except its extreme base, yellow; abdomen one and a half times as long as wide, the third segment in the male bearing a row of black bristles extending from the venter nearly halfway to the middle of the dorsum; wings hyaline, the subcostal and marginal cells, base and usually the very narrow upper edge of the submarginal cell beyond apex of the marginal about halfway to tip of third vein, where it expands and fills the entire apical portion of this cell and encroaches on the first posterior cell, brown, a brown cloud on distal part of anal cell; apex of

fourth vein not or very slightly approaching toward the third vein; legs yellow, apices of middle and hind femora and bases of middle tibiae yellowish brown, hind tibiae largely and last four joints of all the tarsi reddish brown; tibiae and apices of femora sometimes yellowish red; halteres yellow; ovipositor of female almost cylindrical, the basal segment shorter than the last abdominal segment; length 5.5 to 6.5 mm. Two males and four females. Paratypes returned to Mr. Lounsbury.

Habitat.—Bathurst, Cape Colony, Africa.

Type.—Cat. No. 5787, U.S.N.M.

DACUS SIGMOIDES, new species.

Differs from the above description of *brevis* only as follows: The dark brown spot above center of front is connected with the upper two spots in each of the orbital rows, no brown spot below each eye, no mediodorsal black line on the abdomen, apical section of fourth vein strongly bisinuous, the apex strongly approaching toward the third vein, legs yellow, the apices of the femora, bases of the tibiae and last four joints of the tarsi slightly darker, more brownish yellow, knob of halteres yellowish brown, ovipositor greatly flattened, the basal segment one and one-fourth times as long as the last abdominal segment; length 7 mm. A female specimen.

Habitat.—Island of Mauritius, Africa.

Type.—Cat. No. 5788, U.S.N.M.

DACUS IMMACULATUS, new species.

Differs from *brevis* as follows: The spot above center of front scarcely darker than the reddish-yellow frontal vitta, no black spots on the face, bases of palpi pale yellow, yellow spot on each hypopleura nearly twice as long as wide, abdomen almost twice as long as wide, brown in marginal cell not connected with that in apex of the submarginal, the latter extending one-third of distance from apex of third vein to apex of second, ovipositor of female greatly flattened, legs yellow; length 5 to 6.5 mm. Four males and four females. Paratypes returned to Mr. Lounsbury.

Habitat.—East London, Cape Colony, Africa.

Type.—Cat. No. 5789, U.S.N.M.

Near *binotatus* Loew, as I identify it, but with much paler legs and flattened, instead of cylindrical, ovipositor.

CERATITIS RUBIVORA, new species.

Head yellowish, a gray spot streaked with black above the neck and sending a wide stripe to each eye, a black ocellar dot; mouth parts and antennae yellow, the arista short plumose, brown, the base yellow, antennae three-fourths as long as the face, front in both sexes bearing only normal bristles; thorax yellowish brown, largely grayish pruinose, mesonotum marked on each side with a broad, interrupted, black,

polished stripe and with three narrow, indistinct, black, median lines which at their posterior ends expand so as to meet each other; between this point and the scutellum is a transverse pair of polished, whitish spots, humeri whitish, upper part of mesopleura yellow; scutellum yellow, the outer margin marked with three black spots, metanotum polished black, crossed in the middle by a broad, transverse, opaque, grayish pruinose fascia emarginate in the middle of the lower edge, two yellow spots on each side of the metathorax; abdomen yellowish, the third and fifth segments, except a large triangular spot in middle of each, black; wings hyaline, a brown crossband on a line with the humeral crossvein, followed by about ten brown dots; a second brown crossband, yellowish in the vicinity of the small crossvein, extends from the costa beyond apex of auxiliary vein to apex of the sixth, including the small crossvein in its outer portion; a brown stripe, yellowish in the central part, extends close to the costa from beyond apex of first vein to beyond apex of the third, its margins marked with 4 or 5 darker brown dots; an elongated, oblique, brown spot on the fourth vein before its apex, and a larger one bordering the hind crossvein; legs yellow, in the male the front femora marked with a black streak on the upper and another on the posterior side, middle femora on the broad apex, except a streak on the anterior side and the extreme apex, black; hind femora with a black spot before apex of under side prolonged as a streak in the middle of the anterior side; middle tibiae, except the extreme ends, black; in the male the under side of middle femora on the apical half, also the inner and outer sides of the middle tibiae, densely fringed with long flattened bristles; halteres yellowish; ovipositor of female greatly flattened, the basal piece as long as the last two abdominal segments; length 4 to 5 mm. Fifteen males and ten females. Paratypes returned to Mr. Lounsbury.

Habitat.—Wynberg, Cape Colony, Africa.

Type.—Cat. No. 5790, U.S.N.M.

CERATITIS LYCII, new species.

Head yellow, a black spot above the neck, sending a branch to each eye, a black spot in the middle of upper part of face; antennae yellow, three-fourths as long as the face, proboscis brown, the palpi yellow; body black, mesonotum opaque, grayish pruinose, the margin, produced inward at the front and hind angles and in the middle in front, also a pair of round dots behind the suture, polished; a spot on the humerus uniting with a broad stripe on upper edge of pleura, also a sinuous, interrupted line at base of scutellum, light yellowish; abdomen polished, the posterior portion of the first and third segments opaque, whitish pruinose, remainder of third segment opaque, brownish pruinose; ovipositor flat beneath, convex above, the basal portion

as long as the last two abdominal segments; wings hyaline, a broad brown crossband on a line with humeral crossvein, followed by 3 or 4 longitudinal brown streaks and about 9 brown dots, a second brown crossband extends from beyond apex of auxiliary vein to apex of last vein, at the costa united with a broad brown stripe that extends along the costa to midway between apices of third and fourth veins, filling the costal margin to the third vein and near middle of last section of the latter sending a branch obliquely to the wing margin below apex of fourth vein; the second crossband also sends a branch from the small crossvein obliquely to the apex of the fifth vein, covering the hind crossvein; the costal margin is very narrowly hyaline between apices of the first and third veins, except a pair of brown dots between apices of first and second veins; extreme base of wings yellowish; legs, including the front coxæ, yellow; length 4 mm. Two female specimens.

Habitat.—Cape Colony, Africa.

Type.—Cat. No. 5791, U.S.N.M.

ZAPRIONUS, new genus, DROSOPHILIDÆ.

Near *Drosophila*, but the head longer than high, the front femora of the male with tubercles on the under sides, the bristly hairs of mesonotum arranged in distinct rows, and the front and thorax marked with silvery white lines. Front noticeably longer than wide, narrowing anteriorly, two pairs of vertical, one pair of ocellar, and one of postvertical bristles, two pairs of reclinate and more anteriorly one proclinate pair of orbital bristles, vibrissæ stout, middle of face with a very high, broad, rounded carina, antennæ three-fourths as long as the face, the third joint one and a half times as long as broad, arista bearing five long bristles on the upper side and two on the lower, clypeus projecting far beyond the oral margin; proboscis robust, labella fleshy, palpi large, eyes slightly higher than long, densely pubescent; thorax bearing two pairs of dorsocentral bristles, the bristly hairs between the two dorsocentral rows arranged in six distinct rows; five supra-alar bristles, the anterior one in front of the suture, two humeral, two posthumeral and two sternopleural bristles, scutellum bearing four bristles, otherwise bare; auxiliary vein distinct at its base only, small and hind crossveins present, second basal cell confluent with the discal, anal cell present, the vein at its apex reaching about halfway to the wing-margin, axillary angle distinct; front femora of male somewhat thickened, on the apical two-thirds of the under side bearing a row of four short, black, forwardly directed tubercles, each of which bears at the base of the posterior side a backwardly directed spinous bristle; middle and hind femora and all tibiae without bristles except one at apex of inner side of each middle tibia.

Type, the following species:

ZAPRIONUS VITTIGER, new species.

Head and its members yellow, front opaque, dark reddish yellow, a silvery white line along each eye and next to this a dark brown line, a black ocellar dot, several short bristly hairs on lower half of front, eyes bordered with whitish, outer side of second antennal joint largely white, the third joint and the arista brown; mesonotum and scutellum rich dark reddish brown, opaque, the former marked with four nearly equidistant silvery white lines bordered with dark brown, the median pair prolonged over the scutellum, the others passing just above the posthumeral bristles; pleura marked with a median white line, the portion above it yellowish brown, that below it yellow; metathorax brownish yellow, abdomen polished, yellowish brown; legs yellow; wings grayish hyaline; length, 2.5 to 3 mm. Three male specimens.

Habitat.—Cape Colony, Africa.

Type.—Cat. No. 5792, U.S.N.M.

A REVIEW OF THE GOBIOID FISHES OF JAPAN, WITH DESCRIPTIONS OF TWENTY-ONE NEW SPECIES.

BY DAVID STARR JORDAN and JOHN OTTERBEIN SNYDER,
Of the Leland Stanford Junior University.

In the present paper is given a descriptive catalogue of the species of gobies found in the waters of Japan. It is based primarily on the large collection made by the authors in Japan in the summer of 1900, under the auspices of the Hopkins Biological Laboratory of Stanford University. Numerous additional specimens have been presented by the Imperial University of Tokyo through Dr. Kakichi Mitsukuri, and by the Imperial Museum of Japan through Dr. Chiyomatsu Ishikawa. The gobies collected by the U. S. Fish Commission steamer *Albatross* in 1900, the collections in the United States National Museum, and the collections of Professor Keinosuke Otaki in 1895 and 1896 have also been considered, as well as the collections made by Mr. Pierre Louis Jouy in 1885.

A series of typical specimens are in the U. S. National Museum and in the Imperial University of Tokyo. Duplicates have been presented to several other institutions.

The accompanying drawings are the work of Mrs. Chloë Lesley Starks, artist of the Hopkins laboratory, and of Mr. A. H. Baldwin.

MEASUREMENTS.

The measurements given in the tables were made by means of dividers and a proportional scale. In some cases they will be of great value as an aid in discriminating between closely related species. It is believed also that they will show, in an approximately definite way, some of the variations of certain characters useful in the determination of relationships.

They are expressed in hundredths of the length of the body, which is measured from the tip of the snout to the end of the last vertebra. The depth of the body is measured at its deepest part; depth of caudal peduncle at its narrowest place; length of caudal peduncle from base of last anal ray to end of last vertebra; length of head from tip of snout to posterior edge of opercle; length of snout from its tip to anterior margin of orbit; width of interorbital space measured on

the skull, the dividers compressed tightly between the eyes; diameter of orbit, longitudinally; length of caudal fin from end of last vertebra to tip of longest rays. Only fully developed fin rays are counted; the rudimentary rays of dorsal and anal when closely adnate to the first branched ray, are counted with it as one ray; when the soft dorsal contains a spine, it is enumerated as a ray. When last ray of dorsal or anal is double it is counted as one. Scales in the lateral series are counted to base of caudal fin; transverse series from insertion of ventrals or anal, whichever is nearer middle of body, upward and forward; above or below lateral line as indicated in the description.

Family GOBIIDÆ.

THE GOBIES.

Body oblong or elongate, naked or covered with ctenoid or cycloid scales. Dentition various, the teeth generally small but sometimes developed into great canines; premaxillaries protractile; suborbital without bony stay. Skin of head continuous with covering of eyes. Eyes usually moderate, sometimes concealed. Opercle unarmed; preopercle unarmed, or with a short spine; pseudobranchiæ present or absent. Gills 4, a slit behind the fourth; gill membranes more or less united to the isthmus, the gill openings thus restricted to the sides. No lateral line. Dorsal fins separate or connected, the spinous dorsal short, of 2 to 8 flexible spines, or sometimes wanting; anal usually with a single weak spine, the fin similar to soft dorsal; ventral fins close together, separate or united, each composed of a short spine and 3 or 4 soft rays, the inner rays usually longest; the ventral fins when united form a sucking disk, a cross fold of skin at their base completing the cup; caudal fin convex; anal papilla prominent. No pyloric cæca; usually no air bladder. Carnivorous fishes, mostly of small size, living on the bottoms near the shores in warm regions. Some inhabit fresh waters and others live indiscriminately in either fresh or salt water; many of them bury in the mud of estuaries. Few of them are large enough to be of much value as food. The species are for the most part easily recognized, but their arrangement in genera is a matter of extreme difficulty. Until the multitude of Asiatic forms are critically studied, any definition of the Japanese genera must be tentative only.

ANALYSIS OF GENERA OF JAPANESE GOBIIDÆ.

- I. Soft dorsal and anal free from the caudal; body oblong or moderately elongate; eyes distinct; no deep pit above the opercle.
 - a. Spinous dorsal well developed, of 6 or more rays; ventral fins well developed; body well scaled in all Japanese species.
 - b. *Oxymetopontinæ*. Ventral rays I, 4, the two fins wholly separate; tongue pointed; mouth oblique.
 - c. Body elongate, compressed; scales small, cycloid; chin with a thick barbel followed by 3 smaller ones. Dorsal rays about VI-25; isthmus narrow; caudal with filaments. *Vireosa*. 1

bb. Ventral rays I, 5.

d. *Eleotrinæ*. Ventral fins entirely separate; pectorals normal; eyes not erectile; body scaly more or less.

e. Vomer toothless.

f. Preopercle without spine.

g. Scales very large, 25 to 30; fins high; body short, compressed.

Asterropteryx. 2

gg. Scales moderate or small, 40 to 100; body not much compressed.

h. Head not depressed above; scales very small, ctenoid; dorsal spines filamentous; isthmus broad..... *Valenciennea*. 3

hh. Head depressed behind eyes; scales moderate, ctenoid; dorsal spines not elevated; isthmus very narrow..... *Odontobutis*. 4

ff. Preopercle with a concealed, hook-like spine; scales moderate, ctenoid; isthmus broad; dorsal spines low..... *Eleotris*. 5

dd. Ventral fins joined at least at base.

f. *Periophthalminæ*. Pectoral fin with a scaly muscular base; eyes erectile; ventral fins joined at base or to the tip; no barbels; scales very small, cycloid; isthmus broad; tongue short, rounded, scarcely free at tip.

h. Dorsal rays about V-25; head with fine roughnesses; ventral fins united; upper jaw with large exerted teeth; lower teeth horizontal..... *Boleophthalmus*. 6

hh. Dorsal rays about X to XV-12; head with small scales; ventral fins deeply notched; teeth not horizontal and not exerted.

Periophthalmus. 7

ff. *Gobiinæ*. Pectoral fins without scaly muscular base; ventral fins large, completely united and not adnate to the belly; eyes not erectile; dorsal spines 6 or more; body well covered with scales.

i. Teeth all simple, none of them trifid.

j. Chin and lower side of head without barbels.

k. Soft dorsal and anal short, each of 9 to 12 (rarely 13, or 14) soft rays.

l. Cheeks and opercles with large scales; scales on body large, ctenoid; dorsal spines 6..... *Hazeus*. 8

ll. Cheeks naked; opercles chiefly or entirely naked.

m. Tongue truncate or rounded or pointed at tip; gill openings chiefly confined to the sides, separated by a rather broad isthmus.

o. Scales ctenoid, rather large, mouth moderate; head not much depressed anteriorly or between the eyes, chin not prominent; isthmus broad.

p. Pectoral with silk-like free rays above; dorsal spines 6..... *Gobius*. 9

pp. Pectoral without silk-like free rays above.

q. Dorsal spine 6..... *Ctenogobius*. 10

qq. Dorsal spines 7 to 9..... *Aboma*. 11

oo. Scales minute, cycloid; dorsal spines 6; head compressed, convex above, mouth large, oblique, but not opening widely; no silk-like rays on pectorals; some of the dorsal spines often elongate; isthmus narrow.

Cryptocentrus. 12

mm. Tongue emarginate at tip; mouth very large, isthmus narrow, the gill openings extending forward below, head low, depressed, flat between the eyes.

- r. Pectoral without silk-like rays above; chin prominent.
- s. Scales rather large, about 40; dorsal spines 6.
Glossogobius. 13
- ss. Scales minute, 80 to 100.
- t. Dorsal spines 6 ----- *Chænogobius*. 14
- tt. Dorsal spines 7 or 8 ----- *Chloea*. 15
- rr. Pectoral with silk-like rays above; chin not prominent, head very broad, depressed; scales minute, cycloid.
Chasmias. 16
- kk. Soft dorsal and anal long, the former of 14 to 30 rays; dorsal spines 7 to 10.
- u. Scales very small, often cycloid; tongue rounded; head compressed, narrow above, isthmus rather narrow, mouth moderate, oblique; pectoral with free silk-like rays above; soft dorsal and anal rays numerous, slender; color bright.
Pterogobius. 17
- uu. Scales moderate, ctenoid; mouth moderate; isthmus broad.
- v. Soft dorsal moderate, of 14 to 20 rays.
- w. Cheeks naked; snout short, very bluntly decurved; mouth large, very oblique; pectorals without silk-like rays.
Suruga. 18
- ww. Cheeks scaly, at least above; snout long, moderately decurved.
- x. Pectorals without free silk-like rays above.
Acanthogobius. 19
- xx. Pectorals with free silk-like rays above --- *Sagamia*. 20
- vv. Soft dorsal very long, of 20 or more rays; body elongate; caudal pointed; cheeks naked.
Synechogobius. 21
- jj. Chin and edge of lower jaw with barbels.
- x. Dorsal short, about 6 to 11; scales ctenoid, moderate; barbels many on each side; isthmus broad; (a black ocellus on base of caudal above).
- Parachaturichthys*. 22
- xx. Dorsals long, the rays VIII-14 to 25.

y. Barbels about 3 on each side; cheeks scaly; scales cycloid, deciduous, of moderate size; caudal fin pointed; isthmus narrow.

Chaeturichthys. 23

yy. Barbels about 10 on each side; isthmus narrow; scales moderate, rather firm; caudal fin truncate; dorsal rays short VIII-15.

Ainosus. 24

ii. Teeth trifold in the outer series, the inner series simple; body robust, covered with rather large ctenoid scales; head very broad; cheeks tumid, scaleless; tongue rounded; gill openings separated by a broad isthmus; pectoral without silky rays; ventrals as in *Gobius*, not adnate to the belly; dorsal spines 6; soft dorsal and anal short.

z. Edge of preopercle, preorbital, and rami of lower jaw with fringes of barbels; a large pore behind eye.

Trixenopogon. 25

zz. Edge of preopercle, preorbital, and lower jaw without barbels.

Tridentiger. 26

aa. *Luciogobiinae*. Spinous dorsal wanting or reduced to a rudiment of less than 6 rays; ventrals small, united in a short, rounded flap; body naked or with small embedded scales; head broad, depressed above, with tumid cheeks; teeth simple; soft dorsal and anal of moderate length.

a'. Spinous dorsal present, of three small spines; isthmus broad.

b'. Body short and deep; the skin largely scaly *Astrabe*. 27

bb'. Body elongate.

c'. Mouth large, oblique, the chin projecting; body chiefly naked; insertion of dorsal opposite that of anal; suborbital with barbels *Clariger*. 28

cc'. Mouth small, the chin included; body largely scaly; insertion of dorsal far in front of that of anal; suborbital without barbels.

Euteneichthys. 29

aa'. Spinous dorsal wanting.

d'. Isthmus broad; anal fin moderate, its insertion almost directly below that of dorsal; mouth large, oblique; coloration dark.

Luciogobius. 30

dd'. Isthmus very narrow, the gill openings continued forward below; anal long, its insertion considerably before that of dorsal; mouth moderate; color translucent *Leucopsarion*. 31

II. Soft dorsal and anal very long, joined to the caudal; body eel-shaped, elongate and compressed, naked, or covered with very small scales.

e'. *Trypaucheninae*. Temporal region with a deep pit; eyes distinct, small; teeth small; ventral fins small.

f'. Ventral fins divided, but united at base *Trypauchen*. 32

ee'. *Gobioidinae*. Temporal region without fossa; eyes scarcely visible; teeth very long; curved, fang-like.

g'. Soft dorsal and anal very long, of 35 to 50 rays each.

Tenoides. 33

1. *VIREOSA* Jordan and Snyder, new genus.*Vireosa* JORDAN and SNYDER, new genus (*hanæ*).

Body greatly elongate, compressed, covered with minute, cycloid, separated, partly embedded scales; head naked, comparatively short, the forehead blunt, rounded; eyes large; chin with a long, flat barbel, followed by three smaller ones. Mouth large, subvertical; some of the teeth long; small canines present. Ventral fins entirely separate, the rays I, 4. Caudal fin with the upper and lower rays ending in long filaments. Dorsal spines not produced, the rays about VI-25; anal fin long. Gill openings wide, the isthmus narrow; gill-rakers long and slender, pseudo-branchiæ present.

A single species known, from the coast of Japan. The genus is not close to any other, being nearest *Ptereleotris* and *Oxymetopon*. (*Vireo*, to grow green, the name of a genus of birds.)

1. *VIREOSA HANÆ* Jordan and Snyder, new species.

Head $5\frac{1}{2}$ in length; depth, $6\frac{1}{2}$; depth of caudal peduncle, $9\frac{1}{2}$; eye, $3\frac{2}{3}$ in head; snout, $4\frac{1}{2}$; maxillary, $2\frac{2}{3}$; D. VI-25; A. 25; P. 21.

Body very long; slender; compressed; caudal peduncle deep. Head short; its depth contained $1\frac{1}{2}$ times in its length. Interorbital space slightly convex; the distance between the eyes about equal to their

FIG. 1.—*VIREOSA HANÆ*.

longitudinal diameter. Eye large; directed laterally. Snout shorter than diameter of eye; blunt. Lower jaw projecting beyond the upper. Cleft of mouth large; almost vertical. Maxillary extending to a perpendicular passing midway between pupil and anterior edge of orbit; entirely concealed. Teeth in upper jaw in 2 series; the outer consisting of a few large, curved, fang-like canines; the inner of minute, simple teeth, growing close up to and between the canines; side of lower jaw with canines, 2 of which are notably large; minute teeth growing between the larger ones; posteriorly the jaw curves upward; its surface having a row of minute teeth. Tongue slender; compressed laterally; the tip free. Gill openings wide; extending forward below; the width of isthmus separating them about equal to half the diameter of eye. Inner edge of shoulder girdle without protuberances. Pseudo-branchiæ present. Gill-rakers on first arch long; slender; close set.

Chin with a large, median, flat barbel, about as long as the diameter of eye, followed by 3 minute ones which are concealed when the large one is depressed. Nostrils without tubes.

Head naked. Body with minute, cycloid, partly embedded scales; smaller and farther apart anteriorly; larger and more close together posteriorly. The scales appear to the unaided eye like shallow depressions in the skin.

Dorsals separate; the spines slender and flexible; the first 5 close together and evenly spaced; the sixth far removed; the distance between its base and that of the sixth about equal to the space occupied by the first 5; the last spine when depressed reaching insertion of soft dorsal. Anal inserted below the fourth or fifth ray of dorsal; the rays when depressed extending a little farther posteriorly than those of dorsal; neither reaching base of caudal. Caudal long; the upper and lower rays with long, ribbon-like filaments. Ventrals long; divided to the base; rays I, 4; the spine slender.

Color in spirits, whitish; growing brownish above; a narrow light band on posterior part of body, running from a point a little above insertion of dorsal, backward and upward to near middle of base of caudal; body below the band yellowish white; eye with a slightly oblique silvery band about as wide as the orbit. Dorsal fins somewhat dusky; center of caudal dusky; upper and lower parts lighter; upper filaments pearly white; the lower ones dusky; anal light, with a narrow, pearly band at base; pectoral with an indistinct, crescent-shaped light mark near its base.

In life the upper parts are bluish, becoming green on upper part of head with a shade of violet below the green; a reddish blotch at base of pectoral; lateral band above anal, brick red; the band extending on the caudal, where the reddish color becomes diffused over the fin above and below. Spinous dorsal light blue, with a tinge of pink; violet at base, becoming greenish above; 2 indistinct, narrow, blue lines running horizontally near upper edge of fin; caudal bluish, tinged with red; the filaments greenish; pectorals and ventrals with bluish and greenish tints.

The upper edge of the dorsal fins is damaged, so that the height of the rays can not be determined. The tips of the pectoral rays are broken off. The upper edge of the fins shows no trace of filaments.

Measurements.—Length of body, expressed in millimeters, 94; depth, expressed in hundredths of length, 15; depth of caudal peduncle, 10; length of head, 18; length of snout, $4\frac{1}{2}$; width of interorbital space, 4; diameter of orbit, $5\frac{1}{2}$; distance from snout to spinous dorsal, 25; from snout to soft dorsal, 48; distance from snout to anal, $52\frac{1}{2}$; height of longest anal rays, 13; length of caudal peduncle, 10; length of caudal fin, without filaments, 22; with filaments, 52; length of ventral fins, 17.

Type.—No. 6444, Leland Stanford Junior University Museum.

Kuro Shiwo of Japan, one specimen known; taken off Misaki in a net used to sweep for *Mysis*, by Professor Mitsukuri. Its colors in life are singularly delicate.

(*Ihana*, a flower, the name of Professor Mitsukuri's daughter.)

2. ASTERROPTERYX Rüppell.

Asterropteryx RÜPPEL, Atlas, Reise in Nord Afrika, 1828, p. 138 (*semipunctatus*).

Priolepis EHRENBURG fide Bleeker.

Hypseleotris GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 270 (*cyprinoides*).

Body short, deep, compressed, covered with large, nearly smooth scales; eyes moderate; mouth moderate, the teeth medium, uniserial; chin prominent; no teeth on vomer; no spines on preopercle; dorsals separate, the first of six spines, the second like the anal short and high. Ventrals separate, close together, each 1, 5. Gill openings moderate.

Species rather numerous in the East Indian region, one of them ranging north to Japan.

(ἀστὴρ, star; πτέρυξ, fin.)

2. ASTERROPTERYX ABAX Jordan and Snyder, new species.

Head 4 in length; depth $4\frac{3}{4}$; depth of caudal peduncle $6\frac{1}{6}$; eye $3\frac{2}{3}$ in head; snout $4\frac{1}{5}$; D. VI-11; A. 9; P. 16; scales in lateral series 23; in transverse series 8.

Body rather short, greatly compressed; caudal peduncle very deep. Head large; snout short; bluntly rounded. Mouth oblique. Maxillary reaching a perpendicular through posterior edge of orbit. Lips

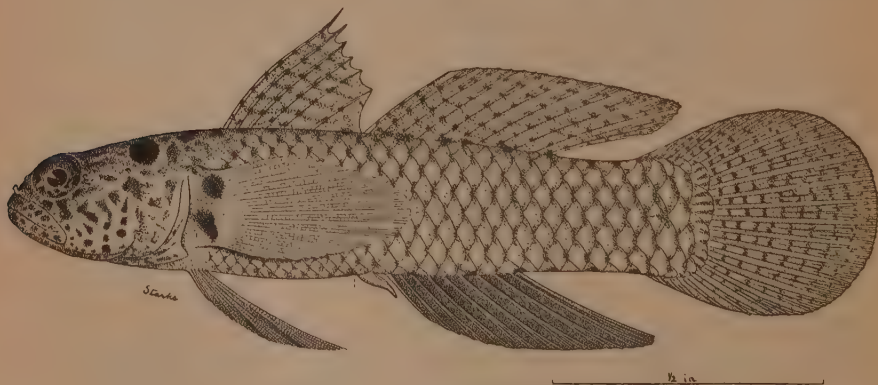


FIG. 2.—*ASTERROPTERYX ABAX*.

thick. Anterior nostril with a high tube. Jaws without barbels. Eyes high in head, directed almost laterally; interorbital space very narrow. Cheeks fleshy, though not much puffed out. Mouth well furnished with strong teeth; upper jaw with 2 series; an outer row of small canines, widely spaced; an inner, narrow band of minute, simple teeth; lower jaw with 3 series; the outer and inner of large canines;

slightly curved; widely spaced; a narrow band of villiform teeth between the canines. No teeth on vomer. Gill opening not extending far forward; the isthmus broad. No papillæ on inner edge of shoulder girdle. Gill-rakers much reduced in size.

Head naked; large pores on interorbital space and behind eyes; a space anterior to dorsal and extending backward a short distance along its base, and the region anterior to pectoral and ventral fins naked; other parts of the body with large, smooth scales. Anal papillæ conspicuous; its distal end fringed.

Fins markedly prominent; dorsals close together; the first spine elongate; when depressed reaching a little beyond insertion of soft dorsal; the latter, when depressed, reaching past base of caudal. Anal inserted below base of second or third dorsal ray; when depressed not reaching so far posteriorly as does the dorsal. Caudal large, rounded. Pectoral pointed; its upper edge without filamentous rays. Ventrals separated at base by a space about equal to half the diameter of eye; sharply pointed; the inner ray much longer than the others.

Color in spirits, light olive; each scale with a dark border; head with black spots, a large prominent one on each side of nape; a median one posterior to these; 2 distinct spots immediately anterior to base of pectoral; rays of dorsals and caudal with small black spots; a vertical row of elongate spots on base of caudal; anal, pectorals, and ventrals with considerable dusky color.

Other specimens were lighter in color, the distinctive markings being more or less plainly represented.

Type.—No. 6445, Leland Stanford Junior University Museum.

Locality, Misaki, Sagami, Japan.

($\alpha\beta\alpha\tilde{\epsilon}$, a checker-board.)

Measurements of Asterropteryx abax.

Length in millimeters.....	33	32	30
Depth expressed in hundredths of length.....	21½	23½	22
Depth of caudal peduncle.....	16	16	16
Length of head.....	25	26	27
Length of snout.....	6	6	6
Length of maxillary.....	11½	11	11½
Width of interorbital space.....	2	2½	2
Diameter of orbit.....	8	6	6
Distance from snout to spinous dorsal.....	34	36	36
Distance from snout to soft dorsal.....	52	54	52
Height of longest dorsal spines.....	26	28	30
Height of longest dorsal rays.....	21	21	20
Distance from snout to anal fin.....	55	57	60
Height of longest anal rays.....	22	21	20
Length of caudal peduncle.....	25	27	26
Length of caudal fin.....	28	27	25
Length of pectoral fin.....	27	28	27
Length of ventral fin.....	22	24	24
Number of dorsal spines.....	6	6	6
Number of dorsal rays.....	11	11	11
Number of anal rays.....	9	9	9
Number of pectoral rays.....	16	16	16
Number of scales in lateral series.....	23	23	23
Number of scales in transverse series.....	8	8	8

3. VALENCIENNEA Bleeker.

Valenciennaea BLEEKER, Boeroe, 1856, p. 412 (*strigata*).

Calleleotris GILL, Proc. Acad. Nat. Sci. Phila., 1863, p. 270 (*strigata*).

Valenciennesia BLEEKER, Archives Nederl., 1874, p. 307 (*strigata*).

Gobiomorus GILL, Proc. U. S. Nat. Mus., 1888, p. 69 (*taiboa* = *strigata*; not of Lacépède, 1801; type *gronovii* = *Nomeus*, Cuvier).

This genus is allied to *Eleotris*, having the same general form. Body rather elongate; head not much depressed, with no spine or bony crests. Mouth moderate, the jaws subequal, the teeth uniserial or nearly so, unequal; no vomerine teeth; pharyngeal teeth sharp; no preopercular spine; head naked, body covered with small, ctenoid scales; isthmus very broad; dorsal spines 6, elevated; soft dorsal and anal short; caudal convex; ventrals separate, the rays I, 5.

East Indies; species not very numerous, one of them extending northward to the Riu Kiu Islands.

(Named for Achille Valenciennes, the distinguished associate of Cuvier.)

3. VALENCIENNEA MURALIS (Quoy and Gaimard).

Eleotris muralis QUOY and GAIMARD, manuscript, Cuvier and Valenciennes, XII, 1837, p. 253, pl. CCCLVII, Tukopia.—BLEEKER, Amboyna and Ceram, p. 276, Amboyna, Ceram.—GÜNTHER, Cat. Fish., III, 1861, p. 130, Philippines.—ISHIKAWA, Cat. Fish., 1897, p. 38, Miyakoshima Is., Riukiu.

Valenciennaea muralis BLEEKER, Boeroe, 1856, p. 412, Boeroe.

Eleotriodes muralis BLEEKER, Goram, p. 212, Goram.

Eleotris longipinnis LAY and BENNETT, Beechey's Voyage of the Blossom, 1839, p. 64, pl. xx, fig. 3, Riukiu, Coll. Lay and Collie.

Head $3\frac{2}{3}$; depth 5 to 6; D. VI-1, 12; A. I, 12. Scales 80. Interorbital space half diameter of eye; second, third, and fourth dorsal spines filamentous. Color clear green, brownish in spirits; head and body with red longitudinal bands; back with some irregular dark cross bars; fins yellow; first dorsal with a black spot behind the top of the third spine; dorsal and anal fins with red longitudinal bands; caudal with red and brown spots. (Günther.)

East Indies; not rare. Two Japanese records, the one that of Lay and Collie, from Riukiu, with a poor sketch, which does not agree with the description, the dorsal filaments being broken; the other that of a specimen from Miyakoshima in the Riu Kiu Islands, noted by Dr. Ishikawa.

(*Muralis*, pertaining to a wall, the color markings resembling the lines in a stone wall: "forment un dessin semblable à des assises de pierre de taille.")

4. ODONTOBUTIS Bleeker.

Odontobutis BLEEKER, Archives Néerlandaises, IX, 1874, p. 305 (*obscurus*).

Body stout, not compressed, covered with rather large, ctenoid scales. Head large, scaly on top and sides, depressed at the crown; no bony crests above; mouth rather large, oblique, the chin projecting; teeth

short, in broad bands; no teeth on vomer; tongue broad, rounded; no preopercular spine; isthmus very narrow, the gill membranes almost separate, and not united with the isthmus; branchiostegals unarmed. Dorsal fins short and low, the first of seven spines; ventrals moderate, separate, each 1, 5.

Japan and China, entering rivers; resembling in form and habit the American genus *Dormitator*.

(ὄδους, tooth; *Butis* a related genus, the name of Indian vernacular origin.)

4. ODONTOBUTIS OBSCURUS (Schlegel).

KAWASUSUKI.

Eleotris obscura SCHLEGEL, Fauna Japonica, Poissons, 1847, p. 149, pl. LXXVII, figs. 1-3; streams tributary to the bay of Nagasaki.—GÜNTHER, Cat. Fishes, III, 1861, p. 115, Japan, Chikiang.—ISHIKAWA, Prel. Cat. Fishes Imp. Mus., 1897, p. 37, Lake Biwa, Maibara, Matsubara, Hikone, Yamashiro, Yamato, Tsuyama.

Odontobutis obscura JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 370, Yokohama.

Head $2\frac{2}{3}$ in length; depth 4; depth of caudal peduncle $2\frac{2}{3}$ in head; eye $6\frac{2}{3}$; snout $3\frac{1}{2}$; maxillary $2\frac{1}{2}$; D. VII-9; A. 8; P. 15; scales in lateral series 36, in transverse series 16.

Form robust; the body thick-set; caudal peduncle deep; not much compressed. Head somewhat broader than the body, but less deep; snout long; pointed; the lower jaw projecting beyond the upper. Eye small; directed almost laterally; interorbital space concave; distance between eyes equal to about half their diameter. Mouth oblique; lips broad; maxillary concealed by lip and preorbital; extending to a vertical through posterior edge of pupil. Tongue very broad; rounded anteriorly. Teeth simple; in narrow bands on jaws; the outer ones not enlarged. Gill opening extending far forward; the isthmus narrow. Inner edge of shoulder girdle without papillæ. Gill-rakers on first arch 1 + 17; far apart; very stubby. Anterior nostril with a low tube. No barbels on chin.

Occiput and cheeks with small scales; snout, preorbital area, chin and throat naked; body with rather large, finely ctenoid scales.

Dorsal fins separate; spinous dorsal when depressed just reaching insertion of soft dorsal. Anal inserted below base of second or third dorsal ray; the posterior rays longest; reaching slightly farther posteriorly when depressed than does the dorsal; both falling far short of base of caudal. Caudel rounded. Pectorals acutely rounded; upper edge without filaments. Ventrals separate; the distance between their bases about equal to two-thirds the diameter of eye.

Body with much brownish or bluish black, in blotches of irregular shape and distribution; sides with 7 or 8 indistinct, narrow, light, lateral bands, which are more evident posteriorly; under part of head with large, light spots.

Soft dorsal and anal with dusky spots arranged in longitudinal rows; caudal with indistinct dark vertical bands; 2 or 3 on the basal half of fin broadest; pectoral with indistinct, dark, vertical bands.

Individuals from the same locality show considerable variation in color. Some are lighter, others darker than the one described. The light spots on the chin and throat are often represented by reticulations, while in some cases the white predominates, there being scarcely any dark color. Very young specimens have 3 dark bands passing over the back, and a broad band of dark color along the sides.

Described from specimens from the Chikugo River, Kurume. This species reaches a length of nearly a foot. It is rather common in estuaries and river mouths from Tokyo southward. Our specimens are from Tokyo Bay, Lake Biwa (Funaki), Chikugo River, at Kurume, and Kawatana, on the Bay of Omura. It is recorded by Günther from Chikiang in China.

(*obscurus*, dusky.)

Measurements of Odontobutis obscurus.

	Chikugo River, Kurume; Chikugo, Japan.			Tokyo, Japan.	
Length expressed in millimeters.....	114	102	82	133	123
Depth expressed in hundredths of length.....	26	24	28	26	27
Depth of caudal peduncle.....	14	14	14	12½	13
Length of head.....	36	35	35	35	35
Length of snout.....	11	10	10	11½	12½
Length of maxillary.....	15	15	16	16	15
Width of interorbital space.....	8	9	8	8	9½
Diameter of orbit.....	6	5½	7	5	5½
Distance from snout to spinous dorsal.....	46½	45	46	46	46
Distance from snout to soft dorsal.....	62½	63½	64	64	64
Height of longest dorsal spines.....	11½	12	11½	14	13
Height of longest dorsal rays.....	15	14	15½	15	14
Distance from snout to anal fin.....	69½	67	67	71½	70
Height of longest anal rays.....	15½	14½	15½	14½	15
Length of caudal peduncle.....	23½	23	23	22	22
Length of caudal fin.....	26	25	26	22½	23
Length of pectoral fin.....	24	25	24½	21½	23
Length of ventral fin.....	17	18½	19	16½	15½
Number of dorsal spines.....	7	7	7	8	7
Number of dorsal rays.....	10	9	9	10	9
Number of anal rays.....	8	9	8	8	8
Number of scales in lateral series.....	35	36	34	34	32
Number of scales in transverse series.....	17	16	17	14	15

5. ELEOTRIS (Gronow) Schneider.

Eleotris GRONOW, Zooph., 1763, p. 83 (nonbinomial).

Eleotris SCHNEIDER, Syst. Ichth., 1801, p. 65 (*pisonis*).

Culius BLEEKER, Archiv. Néerl., IX, 1874, p. 303 (*fuscus*).

Body long and low, compressed behind. Head long, low, flattened above, without spines or crests, almost everywhere scaly. Mouth large, oblique, lower jaw projecting. Lower pharyngeals rather broad, the teeth small, bluntish. Preopercle with a small concealed spine below, its tip hooked forward. Branchiostegals unarmed. Eyes small, high, anterior; isthmus broad. Tongue broad, rounded. Post-temporal bones very strongly divergent, their insertions close together;

top of skull somewhat elevated and declivous; interorbital area slightly convex transversely; dorsal fins well apart, the first of 5 or 6 low, flexible spines; ventrals separate. Scales moderate, ctenoid, 45 to 70 in a longitudinal series; vertebræ (*pisonis*) 11+15. Tropical seas, entering fresh waters.

(ἡλεότρις, name of some small fish in the Nile, possibly from ἡλεός, bewildered, or ἔλεος, a pitiable thing.)

a. Scales small, about 70. Scales of sides with dark centers, forming longitudinal streaks; usually a dusky lateral band; dorsal and caudal with distinct series of brown dots, anal and pectoral faintly barred..... *fusca*. 5

aa. Scales larger, about 50. Sides with pale streaks along the series of scales and with dark dots; head below with round, pale spots; fins with serrated brown bands..... *oxycephala*. 6

5. ELEOTRIS FUSCA (Schneider).

Pacilia fusca SCHNEIDER, Bloch, Syst., 1801, p. 453. (After *Cobitis pacifica* Forster MS. Insulæ oviadæ.)

Eleotris fusca GÜNTHER, Cat. Fishes, III, 1861, p. 125, Ganges, Calcutta, Bengal, Amboyna, Aneitum, Oualan, Wanderer Bay, Ceylon, Canton.—ISHIKAWA, Prel. Cat. Fishes, 1897, p. 31, Riukiu Islands.

Cheilodipterus culius BUCHANAN and HAMILTON, Fish. Ganges, p. 55, pl. v, fig. 16, Ganges.

Eleotris nigra QUOY and GAIMARD, Zool. Voy. Freycinet, Zool., p. 259, pl. LX, fig. 2, Guam, Waigiou.—CUVIER and VALENCIENNES, XII, 1837, p. 235; Isle de France, Ganges, Malabar, Bombay, Java, Otaiti, Borabora, Society Islands, Madagascar.

Culius niger BLEEKER, Boeroe, p. 411, Boeroe.

Eleotris mauritanus BENNETT, Proc. Comm. Zool. Soc., I, 1831, p. 166, Mauritius.

Head $3\frac{1}{5}$ in length; depth 4; depth of caudal peduncle 2 in head; eye 6; snout $3\frac{1}{5}$; maxillary $2\frac{1}{2}$; D. VI-9; A. 9; P. 18; scales in lateral series 73; in transverse series 23.

Body low, deep; compressed posteriorly; the caudal peduncle deeper and more compressed than that of *E. oxycephala*. Eyes small; directed almost laterally; interorbital space flat; distance between eyes slightly greater than length of snout. Snout sharp; lower jaw projecting. Mouth oblique; lips rather narrow; maxillary almost entirely concealed, extending to a vertical passing between pupil and posterior edge of orbit. Tongue rounded anteriorly. Teeth simple; in bands on both jaws; the outer and inner ones slightly enlarged; a narrow naked space on lower jaw at the symphysis. Gill openings not extending far forward below; width of isthmus about equal to length of maxillary. Gill-rakers on first arch 2+10; reduced to mere elevations. Inner edge of shoulder girdle without papillæ. Nostrils small; the anterior with a tube. No barbels on jaw. Edge of preopercle with a strong, sharp spine, which projects downward and forward.

Head almost completely scaled; a small, naked area in front of the eye and on anterior part of chin; minute scales on upper part of head, running forward on snout; on cheeks, rami of lower jaw, and on

branchiostegal region. Body covered everywhere with small scales; those on nape, breast, and belly cycloid; on sides weakly ctenoid.

Dorsal spines slender; flexible; the tips with short, projecting filaments; the spines when depressed reaching slightly beyond insertion of soft dorsal. Caudal rounded. Anal rays longest posteriorly; when depressed they reach as far backward as do those of the dorsal, both falling far short of reaching the base of caudal. Pectorals pointed; the upper rays without free filaments. Ventrals separate; pointed.

Color in spirits, brownish; with indistinct, narrow, longitudinal, dark bands on body; 3 narrow, brownish bands radiating from posterior edge of eye.

This description is of specimens about 130 millimeters long, collected by Dr. O. P. Jenkins in Honolulu, Hawaiian Islands.

Islands and shores of the Western Pacific Ocean, especially in the mouths of streams; recorded from many localities. The only Japanese record is that of a specimen in the Imperial Museum, recorded by Ishikawa, from the Riukiu Islands.

(*fusca* dusky.)

6. ELEOTRIS OXYCEPHALA (Schlegel).

Eleotris oxycephala SCHLEGEL, Fauna Japonica, 1845 or 1846, p. 150, pl. LXXVII, figs. 4, 5, Nagasaki.—GÜNTHER, Cat. Fish, III, 1861, p. 116, China.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 371, Lake Biwa.

Eleotris cantherius RICHARDSON, Ich. China, 1846, p. 209, Macao.

Head $3\frac{1}{2}$ in length; depth 4; depth of caudal peduncle $2\frac{1}{4}$ in head; eye $8\frac{1}{2}$; snout $3\frac{3}{4}$; maxillary; D. V-9; A. 9; P. 18; scales in lateral series 50; in transverse series, 15.

Body deep; compressed; caudal peduncle greatly compressed. Head long; pointed. Snout rather sharp; the lower jaw projecting. Eyes very small; directed laterally; interorbital area flat; the distance between eyes $3\frac{1}{2}$ times their longitudinal diameter. Mouth very oblique. Maxillary except its distal part concealed; reaching a vertical between pupil and posterior edge of orbit. Tongue broad; the anterior edge concave. Teeth simple; in rather broad bands on jaws; the anterior and posterior ones enlarged. Gill openings not extending very far forward; the width of isthmus equal to length of snout. Inner edge of shoulder girdle without elevations. Gill-rakers on first arch 3 + 10; stubby; covered with setæ. Posterior border of preopercle with a blunt spine which projects downward. Anterior nostril with a low tube. No barbels on lower jaw.

Head with scales, except on snout, throat, and chin; occiput and cheeks with small cycloid scales. Body with large ctenoid scales; those on nape, breast, and belly smaller; cycloid.

Dorsals separate; the spines when depressed just reaching insertion of soft dorsal; posterior rays of soft dorsal longest; when depressed they reach base of caudal. Caudal rounded. Anal inserted below

bases of second or third dorsal rays; when depressed the rays do not quite reach base of caudal. Pectoral acutely rounded; the upper rays without filamentous tips. Ventrals separate; pointed.

Scales with subdued, dark, lateral bands; a narrow brownish band running obliquely downward from eye to edge of preopercle; a similar but shorter band above the latter extending directly backward. Spinous dorsal with two brownish lines running horizontally; soft dorsal with brownish, inverted V-shaped marks on the membranes. Caudal and pectorals with small brownish spots arranged in vertical rows. Anal with indistinct dark markings.

Described from a specimen about 230 millimeters long from near Yokohama. A smaller specimen has 6 dorsal spines.

Coasts of China and southern Japan, rather rare, entering fresh waters; our specimens from Haneda, near Yokohama, from Wakanoura, and from Lake Biwa.

(ὄξύς, sharp; κεφαλή, head.)

6. BOLEOPHTHALMUS Cuvier and Valenciennes.

Boleophthalmus CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, 1837, p. 198 (*boddarti*).

Scartelaos SWAINSON, Classn. Fishes, II, 1839, p. 279 (*viridis*).

Boleops GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 271 (*aucupatorius*).

Body elongate, compressed behind; covered with very small or rudimentary scales. Head not depressed nor compressed, the mouth moderate, little oblique, the lower jaw included. Eyes placed high, close together, prominent, the lower eyelid well developed. Teeth in one row above, two below; some of the upper prominent, canine-like, projecting; outer row of lower teeth nearly horizontal (dilated at tip in typical species). Tongue broad, rounded, and scarcely free at tip. Dorsal fins separate, the first high, of about 5 slender spines, filamentous at tip; second dorsal and anal long; caudal rounded; basal portion of the pectoral fin muscular and covered with small scales; ventral fins completely united; caudal oblong, the lower part obliquely truncate; isthmus broad.

Fishes of the estuaries of the East Indies, one species extending northward to Japan. Like the species of *Periophthalmus*, they are able to skip about on the mud by the use of the muscular pectorals. (βολή, throwing; ὀφθαλμός, eye.)

7. BOLEOPHTHALMUS CHINENSIS (Osbeck).

Apocryptes chinensis OSBECK, Aman. Acad., 1754, p. 29, fig. 23, Coll. Lagerstrom, Canton; Reise nach China, 1757, p. 170, Canton, pre-Linnæan; Voyage to China, English edition, 1771, p. 200, Canton.

Gobius pectinirostris GMELIN, Syst. Nat., I, 1788, p. 1200, China, after Lagerstrom and Osbeck, and of the copyists Bonnaterre, Schneider, Lacépède, Shaw, etc.

Apocryptes pectinirostris CUVIER and VALENCIENNES, XII, 1837, p. 150 (after Osbeck).

- Boleophthalmus pectinirostris* RICHARDSON, Ichth. China, 1846, p. 208, Canton.—
GÜNTHER, Cat. Fish., III, 1861, p. 102, Penang, Molucca, Ningpo, Amoy.—
ISHIKAWA, Cat. Fish., 1897, p. 38, Hizen (Nagasaki), China.
Boleophthalmus boddarti SCHLEGEL, Fauna Japonica, 1847, p. 148, pl. LXXVI, fig. 3,
Nagasaki (not *Gobius boddarti* Pallas, of the East Indies).

Head $4\frac{1}{2}$ in length; depth $6\frac{1}{4}$; depth of caudal peduncle $2\frac{3}{4}$ in head; eye 6; snout $3\frac{2}{3}$; maxillary $2\frac{1}{2}$; D. V-25; A. 25; P. 19.

Body notably elongate; caudal peduncle deep; compressed. Head of moderate size, a little broader than body. Snout rather short, blunt. Eyes small, the lower lid enlarged so that it easily covers the eye; upper part of eye with skin similar to that of head. Interorbital space narrow; a slight ridge along its middle. Mouth oblique; upper lip thick; maxillary concealed throughout, extending to a vertical through a point a little posterior to eye. Tongue not free at tip. Teeth of upper jaw in a single row; 3 or 4 enlarged canines on each side anteriorly; the teeth posterior to the canines abruptly smaller; sharp; those of lower jaw in 2 rows; the inner row represented by a strong canine on each side of symphysis; those of the outer row placed horizontally; projecting outward beyond edge of jaw; anteriorly, simple and with rounded points; posteriorly, their cutting edges are broadened and notched. Gill openings small, restricted to the sides. No elevations on inner edge of shoulder girdle. Gill-rakers 6+6; short; pointed. No barbels on chin.

Head and anterior parts of body covered with conspicuous, conical, tubular papillæ. (On some specimens the skin is covered with mucus, the large openings of the tubes looking like white spots.) Body with cycloid scales; rather large posteriorly, becoming smaller and disappearing anteriorly.

Dorsals separate; the spines long, slender, and filamentous; the third projecting about half its length beyond the membrane; soft dorsal with a very long base; the rays of about the same height throughout. Anal inserted below base of fourth dorsal ray; similar in shape to dorsal, except that the rays are much shorter; when depressed, reaching base of caudal, but not extending so far posteriorly as do those of the dorsal. Caudal and pectorals rather acutely rounded; no filaments on upper edge of the latter. Ventrals short; free posteriorly.

Color of body plain brownish. Spinous dorsal bluish, with round or slightly oblong white spots with darker borders. Soft dorsal of same color, with elongate white spots arranged in 7 longitudinal rows; the spots more nearly round near base of fin, becoming elongate and linear near the top. Caudal with round or elongate white spots in vertical rows. Other fins light in color and without spots.

Coast of China and Japan, generally common in muddy bays southward. Our description based on specimens from the Bay of Tokyo. We also have representatives from Nagasaki.

Measurements of *Boleophthalmus chinensis*.

	Bay of Tokyo.		Uriake, near Nagasaki.
Length expressed in millimeters.....	141	120	146
Depth expressed in hundredths of length.....	17	15	16½
Depth of caudal peduncle.....	9	10½	9½
Length of head.....	24½	26	24
Length of snout.....	7	6½	6½
Length of maxillary.....	12	12	11
Width of interorbital space.....	1	1	1
Diameter of orbit.....	4	4½	4
Distance from snout to spinous dorsal.....	33	34	33
Distance from snout to soft dorsal.....	51	52	51½
Height of longest dorsal spines.....	34	36	35½
Height of longest dorsal rays.....	14	14	16½
Distance from snout to anal fin.....	56	57	56½
Height of longest anal rays.....	9	8	9½
Length of caudal peduncle.....	9	8	7½
Length of caudal fin.....	23	25	27
Length of pectoral fin.....	15	14	16
Length of ventral fin.....	16	12	16
Number of dorsal spines.....	5	5	5
Number of dorsal rays.....	25	25	25
Number of anal rays.....	25	25	25

7. PERIOPHTHALMUS Schneider.

Periophthalmus SCHNEIDER, Syst. Ichth., Bloch, 1801, p. 63 (*papilio*).

Euchoristopus GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 271 (*kelreuteri*).

? *Periophthalmodon* BLEEKER, Archiv. Néerl., IX, 1874, p. 326 (*schlosseri*). (Ventral fins more nearly united; dorsal spines in smaller number; scales large.)

Body oblong, subcylindrical, covered with very small cycloid scales. Head large, the sides with minute scales; mouth rather small, horizontal, the chin included; teeth moderate, conical, vertical in both jaws; eyes high, very close together, erectile, the outer eyelid well developed; tongue broad, rounded, little free at tip. Dorsal fins 2, the first long of 10 to 15 spines; second dorsal and anal short; pectoral fin with a scaly muscular base; ventral fins broad each I, 5, more or less completely separated; caudal obliquely truncate below. Isthmus broad. Vertebrae 11 + 15 = 26. No air bladder.

Small fishes of the estuaries and mud flats of the East Indian region, one species ranging northward to Japan. They are said to range about on land in muddy places, in pursuit of insects, etc., on which they feed. (περί, around; ὀφθαλμός, eye.)

8. PERIOPHTHALMUS CANTONENSIS (Osbeck).

Apocryptes cantonensis OSBECK, Reise nach China, 1757, p. 171, Canton, pre-Linnaean; Voyage to China, English edition, 1771, p. 201, Canton.

Periophthalmus modestus CANTOR, Ann. Mag. Nat. Hist., IX, 1842, p. 29, Chusan.—RICHARDSON, Ich. China, 1846, pp. 208, 319 (after Cantor and Schlegel).

Periophthalmus modestus SCHLEGEL, Fauna Japonica, 1847, p. 147, pl. LXXVI, fig. 2, Nagasaki.

Periophthalmus kelreuteri, var. *modestus* GÜNTHER, Cat. Fish., III, 1861, p. 98, Ningpo, Hongkong, Chusan.—ISHIKAWA, Cat. Fish., 1897, p. 38, Gyotaku, Shimosa, Kishiw, Hizen.

Gobius tannoo RICHARDSON, Ichth. China, 1846, p. 206 (after Osbeck).

Head 4 in length; depth 5½; depth of caudal peduncle 2½ in head;

eye $4\frac{1}{3}$; snout $3\frac{1}{2}$; maxillary $2\frac{2}{3}$; D. XIV-12; A. 12; P. 14; scales in lateral series 75; in transverse series 27.

Body elongate; compressed. Head large; the snout notably short and blunt anteriorly. Eyes small; high in head; their upper edges projecting above the dorsal contour; interorbital space very narrow; with a median linear depression. Cleft of mouth horizontal. Lips thin; pendulous; suborbital part of head with a pendulous flap. Maxillary completely concealed; extending to a vertical through pupil. Teeth in a single row in each jaw; simple, strong, and sharp; no enlarged canines. Gill opening small. Gill-rakers on first arch minute; stubby; no barbels on chin. Lower eyelid well developed; capable of extending over the whole eye.

Head naked except on upper edge of opercle and on occiput. Body with very small cycloid scales.

Spinous dorsal long and high, the spines varying in number from 12 to 16; higher anteriorly, growing gradually shorter posteriorly; when depressed not reaching insertion of soft dorsal. Rays of soft dorsal of about the same length throughout. Anal inserted on a vertical passing a little anterior to insertion of soft dorsal, its rays when depressed not reaching so far posteriorly as do those of dorsal, both falling far short of base of caudal. Pectorals and caudal rounded. Ventrals short; partially united by a very thin membrane.

Color in spirits brownish; darker above than below; small dark specks scattered over sides and upper parts. Color of spinous dorsal growing a little darker toward border of fin. Soft dorsal with a row of brown spots, one on each ray, along its base; a broad brownish band a little above middle of fin; outer parts of fin transparent. Caudal and pectorals dusky; the latter with brown specks. Anal and ventrals light.

Coasts of China, Korea, and southern Japan; rather common in muddy bays. Here described from specimens collected at Yotoku, Bay of Tokyo, presented by the Imperial Museum.

Measurements of Periophthalmus cantonensis.

Length expressed in millimeters.....	68	69	73	66	66
Depth expressed in hundredths of length.....	20	19	19	18	18
Depth of caudal peduncle.....	11	9 $\frac{1}{2}$	11	10	11
Length of head.....	25	24	24 $\frac{1}{2}$	24	25
Length of snout.....	6	6	6	6	7
Length of maxillary.....	8 $\frac{1}{2}$	8	8	8	8
Width of interorbital space.....	1	1	1	1	1
Diameter of orbit.....	5 $\frac{1}{2}$	5	5 $\frac{1}{2}$	5 $\frac{1}{2}$	5
Distance from snout to spinous dorsal.....	35	35	35	34	36
Distance from snout to soft dorsal.....	61	59	59	59	61
Height of longest dorsal spines.....	18	15 $\frac{1}{2}$	18	19	15
Height of longest dorsal rays.....	13	12	13	13	13
Distance from snout to anal fin.....	64	60	61	65	61
Height of longest anal rays.....	8	7	8 $\frac{1}{2}$	8	7
Length of caudal peduncle.....	20	20	21	21	20
Length of caudal fin.....	22	22 $\frac{1}{2}$	23	23	23
Length of pectoral fin.....	22	20	19	21	17
Length of ventral fin.....	12 $\frac{1}{2}$	11	12	12	12
Number of dorsal spines.....	13	13	13	13	16
Number of dorsal rays.....	12	12	12	12	12
Number of anal rays.....	12	12	12	12	12
Number of scales in lateral series.....	76	74	78	75	73
Number of scales in transverse series.....	28	27	26	26	26

8. HAZEUS Jordan and Snyder.

Hazeus JORDAN and SNYDER, new genus (*otakii*).

This genus agrees with *Otenogobius* in all respects, except that the cheeks are covered with large scales, as in *Bollmannia*, from which the presence of but six dorsal spines especially separates it. Two species known. (*Haze*, the Japanese name for all small gobies.)

9. HAZEUS OTAKII Jordan and Snyder, new species

Head $3\frac{1}{2}$ in length; depth $5\frac{1}{3}$; depth of caudal peduncle $2\frac{2}{3}$ in head; eye 3; snout 4; maxillary $2\frac{3}{4}$; D. VI-9; A. 10; P. 17; scales in lateral series 24, in transverse series 7.

Body thickset; the contours sloping slowly and gradually from head to caudal peduncle, which is about half as deep as body. Head large; as broad as deep. Snout short; rather pointed. Eyes large, directed obliquely upward; interorbital space very narrow. Mouth oblique; the jaws equal; maxillary extending about to edge of pupil, concealed beneath the suborbital and the thick lip. Teeth simple; in bands on

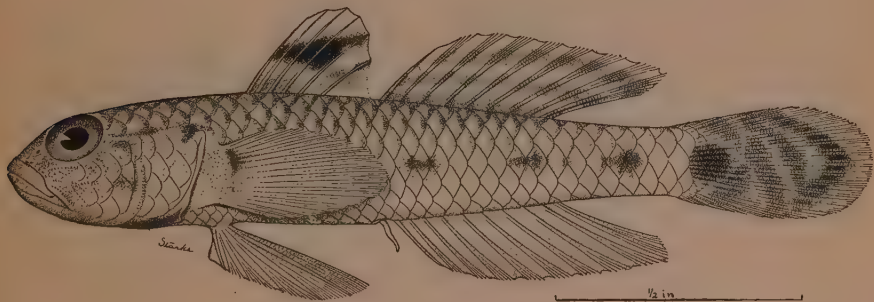


FIG. 3.—HAZEUS OTAKII.

both jaws; outer ones considerably enlarged; the most posterior large tooth on each side of lower jaw a little stronger than the others and curved backward. Gill openings not extending far forward; the isthmus narrow. No papillæ on inner edge of shoulder girdle. Gill-rakers rather long; not very slender. No barbels on jaw. Anterior nostril with a tube.

Head with large cycloid scales on nape and cheeks; snout, chin, and throat naked. Body with large ctenoid scales, which are easily displaced. Scales on occiput and nape large, there being 7 in a row between interorbital space and base of first dorsal spine. Anal papilla notably long and slender.

Dorsals separate; highest spines about equal in length to depth of body; rays a little higher; when depressed, the fin does not reach base of caudal. Anal inserted below base of second or third dorsal ray; tip of depressed fin reaching slightly farther backward than does

the dorsal. Pectoral pointed; upper edge of fin without filaments. Ventrals free posteriorly, extending to vent.

Body with 6 small, dark spots along the sides; the anterior one at upper edge of gill opening; the posterior on base of caudal fin; branchiostegal membranes edged with dusky; each scale on head and body with a dusky margin. Dorsals and caudal with small black blotches arranged in wavy lines; anal broadly bordered with dusky; pectorals and ventrals with but little dusky color.

The species is represented by a single specimen, 44 millimeters long, from Nagasaki. It is recorded as type No. 6446, Leland Stanford Junior University Museum.

(Named for Keinosuke Otaki, professor in the Imperial Military Academy of Tokyo, a former student of Stanford University, who accompanied us in our travels through northern Japan, and to whom we are indebted for many favors.)

9. GOBIUS (Artedi) Linnæus.

Gobius ARTEDI, Genera, 1738, p. 28 (*niger*).

Gobius LINNÆUS, Syst. Nat., 10th ed., 1758, p. 262 (*niger*).

Body oblong, compressed behind. Head oblong, moderately depressed; the snout rounded. Eyes large, anterior, close together; opercles unarmed. Mouth moderate, not greatly oblique, the chin not prominent. Teeth conical, in few series, none of them canine. Tongue not notched; isthmus broad. Skull depressed, abruptly widened behind the eyes and without distinct median keel. Scales moderate, ctenoid, cheeks naked, no barbels; no fleshy flaps on shoulder girdle. Dorsal with 6 slender spines and about 10 soft rays. Anal short; ventrals fully united, not adnate to the belly; pectorals with free, or silk-like rays above; caudal fin obtuse.

Species few, but widely diffused; found in all warm seas.

(*Gobius*, the gudgeon, or other small fish.)

10. GOBIUS PÆCILICHTHYS Jordan and Snyder, new species.

Head $3\frac{1}{2}$ in length; depth 5; depth of caudal peduncle $2\frac{1}{2}$ in head; eye $3\frac{3}{4}$; snout $2\frac{3}{4}$; maxillary $2\frac{3}{8}$; D. VI-10; A. 9; P. 18; scales in lateral series 37, in transverse series 13.

Body rather thickset; cylindrical anteriorly; the caudal peduncle compressed. Head as broad as body. Eyes large; directed laterally; the upper edges projecting slightly, making the interorbital space concave. Snout blunt, rather acutely rounded. Jaws equal; lips wide, the lower forming a broad fold over the upper at their union; maxillary entirely concealed, extending to a vertical passing between pupil and anterior margin of orbit. Teeth simple, in rather broad bands on jaws, the outer ones somewhat enlarged. Tongue broad anteriorly,

only the edge of tip free. Gill openings restricted laterally; isthmus very broad; its width almost equal to depth of caudal peduncle; edge of shoulder girdle without papillæ. Gill-rakers slender.

Head naked; no barbels on chin; anterior nostrils with tubes. Body with large, finely ctenoid scales; those on nape and breast minute.

Dorsals separate, though close together; spines slender, the anterior ones highest; rays somewhat higher than spines, growing gradually shorter from before backward. Anal inserted below third or fourth dorsal ray, extending posteriorly as far as dorsal, both falling far short of base of caudal. Caudal large, broadly rounded. Pectoral rounded posteriorly, its upper edge with conspicuous, free filaments. Ventrals nearly reaching vent; free posteriorly.

Head and body clouded with brownish black. Spinous dorsal with a broad, blackish blotch; fin with a wide, white margin; the first spine with 4 small, black spots. Soft dorsal with narrow, zigzag, dusky bands; the spine with 3 small, elongate, black spots. Upper two-thirds of caudal with oblong, dusky spots; lower third without marks.

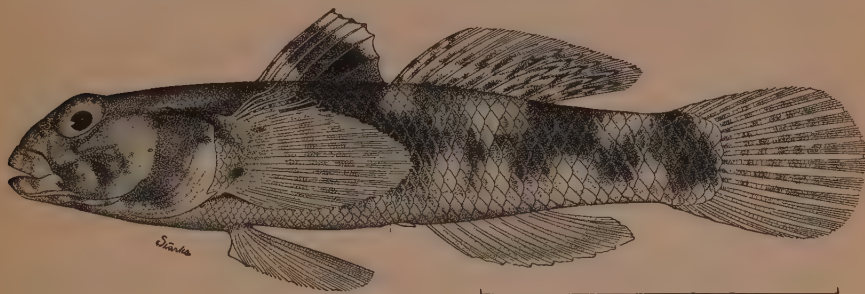


FIG. 4.—GOBIUS PŒCILICHTHYS.

Pectoral with indistinct, dusky spots arranged in vertical rows. Ventrals and anal with a little dusky color; the latter with a white margin.

The species is represented by 2 specimens, the type No. 6448, Leland Stanford Junior University Museum, and another very small one from Misaki, Sagami.

Measurements.—Length expressed in millimeters, 48; depth expressed in hundredths of length, 21; depth of caudal peduncle, 13; length of head, 29; length of snout, 10; length of maxillary, 11; width of interorbital space, 1; diameter of orbit, $7\frac{1}{2}$; distance from snout to spinous dorsal, 37; to soft dorsal, 55; height of longest dorsal spines, 14; rays, $17\frac{1}{2}$; distance from snout to anal, 51; height of longest anal rays, 15; length of caudal peduncle, 24; length of caudal fin, 25; length of pectoral, 25; of ventral, 23.

Pœcilichthys, *ποικίλος* variegated; *ἰχθύς* fish, name of a genus of American Percidæ, which this fish much resembles.

10. CTENOGOBIUS Gill.

Ctenogobius GILL, Fish. Trinidad, 1858, p. 374 (*fasciatus*).

Euctenogobius GILL, Ann. Lyc. Nat. Hist., N. Y., 1859, p. 45 (*badius*).

Rhinogobius GILL, Proc. Ac. Nat. Sci., Phila., 1859 (*similis*).

Coryphopterus GILL, Proc. Ac. Nat. Sci., Phila., 1863, p. 263 (*glaucofrænum*).

Accentrogobius BLEEKER, Archiv. Néerl., IX, 1874, p. 321 (*chlorostigma*).

Zonogobius BLEEKER, Archiv. Néerl., IX., 1874, p. 323 (*semifasciatus*).

Body oblong, compressed behind. Head oblong, not much depressed. Eyes high, anterior, close together; opercles unarmed. Mouth moderate, the lower jaw usually shortest. Teeth on jaws only, conical, in few or several series, those in the outer row enlarged; no large canines; tongue usually truncate. Isthmus broad. Shoulder girdle without fleshy flaps or papillæ. Skull depressed, abruptly widened behind the eyes and without distinct median keel. Scales moderate or large, ctenoid, permanently covering the body; cheeks naked; opercles naked, or scaled above only; belly generally scaly. Dorsal with 6 rather weak spines; pectorals well developed, the upper rays without free or silk-like tips; ventrals completely united, not adnate to the belly; caudal fin usually obtuse.

Species numerous in Asia and America. The genus *Ctenogobius*, as here understood, comprises a large number of species more or less closely related to the European genus *Gobius*, in which genus the species have been usually placed. The species of *Gobius* are larger in size, with a different physiognomy and with silk-like free tips to the upper rays of the pectorals.

(κρείς, comb; *Gobius*.)

- I. Opercles scaly on the upper half; scales about 36; body with dark bands and streaks; first dorsal filamentous, with a black blotch on last rays; caudal streaked *abei*. 11
- II. Opercles entirely naked.
 - a. Nape with a naked area; head rather large; dorsal spines in adult filamentous.
 - b. Scales 31; body rather robust; dorsal elevated in the adult and margined with white; caudal unspotted; body olivaceous, with faint lateral blotches. *similis*. 12
 - bb. Scales 26; body more elongate; dorsals edged with black, finely spotted; caudal spotted above, the lower part abruptly without spots, body with small spots *gymnauchen*. 13
 - aa. Nape closely scaled; scales of body 26 to 28.
 - c. Head large, $3\frac{1}{2}$ in length; fins large; sides with 6 conspicuous black spots; dorsals spotted; caudal with faint wavy bands *hadropterus*. 14
 - cc. Head moderate, about 4 in length.
 - d. Body sparsely covered with round dark spots, and with faint longitudinal stripes; dorsal spotted; caudal vaguely banded *campbelli*. 15
 - dd. Body without well-defined round black spots; a black blotch at base of caudal.
 - e. Sides with 5 distinct narrow streaks along the rows of scales; eye small, nearly 4 in head; no long dark blotch on chin and throat. *virgatulus*. 16
 - ee. Sides without well defined stripes; eye large, $3\frac{1}{2}$ in head; branchiostegal region blackish *pflaumi*. 17

II. CTENOGOBIUS ABEI Jordan and Snyder, new species.

Head $3\frac{3}{8}$ in length; depth $5\frac{1}{4}$; depth of caudal peduncle 2 in head; eye $3\frac{2}{3}$; snout 4; maxillary $2\frac{3}{8}$; D. VI-9; A. 9; P. 16; scales in lateral series 36, in transverse series 13.

Body short, thick, cylindrical anteriorly; caudal peduncle compressed. Head large; snout bluntly rounded. Eyes of moderate size directed laterally; interorbital space somewhat convex; distance between eyes equal to $1\frac{1}{2}$ times their diameter. Mouth oblique; jaws equal; maxillary concealed, extending to a vertical through posterior part of pupil. Teeth in narrow bands on both jaws; the outer ones enlarged. Tongue concave anteriorly. Gill openings restricted to the sides; isthmus broad; its width contained about 3 times in head. No papillae on inner edge of shoulder girdle. Gill-rakers very short and blunt. Anterior nostril with a tube. No barbels on head.

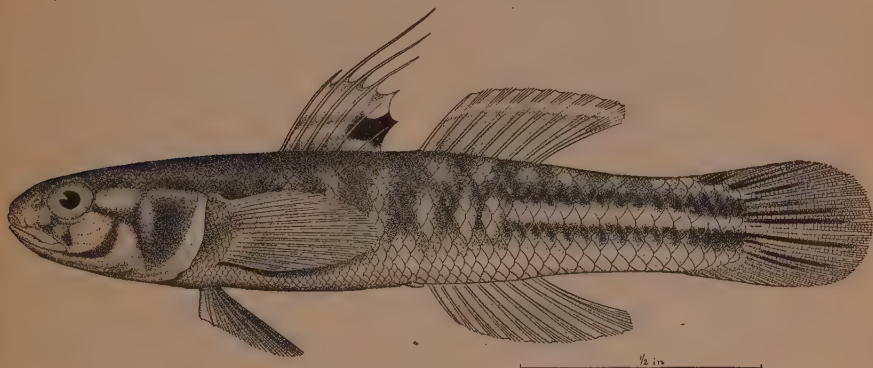


FIG. 5.—CTENOGOBIUS ABEI.

Occiput and upper part of opercles with scales, head otherwise naked; body covered everywhere with finely ctenoid scales, small anteriorly, growing gradually larger posteriorly.

Dorsals separate; the spines with long, projecting filaments; when depressed they reach beyond insertion of soft dorsal; rays a little longer posteriorly; when depressed not reaching base of caudal. Anal inserted below base of second dorsal ray; when depressed, reaching as far posteriorly as does the dorsal. Caudal rounded. Pectorals pointed; the upper rays without free filaments. Ventrals free posteriorly from belly.

Color in spirits, light olive, mottled and banded with brownish black. Anterior half of body with 5 broad, vertical dark bands; posterior half with 2 longitudinal dark bands extending on base of caudal fin; the upper band connected with its fellow on the opposite side of body by indistinct dark bands which nearly coalesce into a dark mass of color. Head with dark reticulations. Spinous dorsal with a black

spot on its posterior part; soft dorsal, anal, pectorals and ventrals dusky; caudal dusky, with dark lines running in the direction of the rays.

Type.—No. 6447, Leland Stanford Junior University Museum, collected at Wakanoura, Kii.

Another specimen has 41 scales in the lateral series and 15 in the transverse series.

The species is easily distinguished from *II. otakii* by its much smaller scales and peculiar dark color markings.

(Named for Mr. Kakichi Abe, of Tokyo, a former student of Stanford University, who accompanied us in our travels throughout southern Japan, to the great advantage of our work.)

Measurements of Ctenogobius abei.

Length in millimeters	36	35
Depth expressed in hundredths of length	20	19
Depth of caudal peduncle	14	13
Length of head	27	29
Length of snout	6	7
Width of interorbital space	6	7
Diameter of orbit	6	5
Distance from snout to spinous dorsal	38	38
Distance from snout to soft dorsal	58	60
Height of longest dorsal spines	24	31
Height of longest dorsal rays	13	19
Distance from snout to anal fin	60	57
Height of longest anal rays	13	16
Length of caudal peduncle	24	24
Length of caudal fin	23	25
Length of pectoral fin	22	22
Length of ventral fin	16	16
Number of dorsal spines	6	6
Number of dorsal rays	9	9
Number of anal rays	9	9
Number of scales in lateral series	41	36
Number of scales in transverse series	15	13

12. CTENOGOBIUS SIMILIS (Gill).

Rhinogobius similis GILL, Proc. Ac. Nat. Sci., Phila., 1859, p. 145, near Shimoda. Coll. J. Morrow, Comm. Perry Exp.

Gobius similis JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, Ishikawa Province, Japan; Proc. U. S. Nat. Mus., XXIII, 1901, p. 759, Yokohama, Tsushima, Coll. P. L. Jouy.

Gobius yokohamæ GÜNTHER, Ann. Mag. Nat. Hist., 1877, p. 437, Yokohama.

Head $3\frac{1}{3}$ in length; depth 5; depth of caudal peduncle $2\frac{1}{3}$ in head; eye $5\frac{1}{2}$; snout $2\frac{1}{4}$; maxillary 2; D. VI-9; A. 9; P. 19; scales in longitudinal series 31, in transverse series 11.

Head and body of nearly the same depth throughout, the caudal peduncle slightly constricted. Head very broad; its width contained $1\frac{2}{5}$ in its length; the muscles of the cheeks greatly developed, and bulged out far beyond the contour of the body. Eyes small, directed obliquely upward, projecting above the dorsal outline of head, making the interorbital space convex. Snout long, rather blunt. Jaws about equal, the upper slightly projecting. Maxillary entirely concealed by the fleshy lip and overhanging preorbital, extending to a vertical

passing between anterior edge of orbit and pupil. Teeth in narrow bands on both jaws; those in outer row of upper jaw considerably enlarged; the outer ones of lower jaw enlarged, though somewhat smaller than the corresponding ones above. The area bearing teeth extends farther back on the lower than on the upper jaw. Gill opening not extending far forward, the width of the isthmus contained about 3 times in length of head. Inner edge of shoulder girdle with a narrow ridge, but without papillæ. Gill-rakers on first arch 2 + 8; short; pointed; far apart. Anterior nostril with a short tube; the posterior with a narrow rim. Lower jaw without barbels.

Head naked; the skin loose and somewhat wrinkled, with a number of elevated mucous pores nearly as large as the nostrils; 1 on each side, above and before the eyes; 1 on the posterior part of interorbital space; 2 behind each eye, and a row of 4, the uppermost of which is largest, along the posterior edge of preopercle.

Scales large above, very small on belly; ctenoid growing smooth on anterior and on ventral parts. Nape with a naked space, the scales extending forward in 3 pointed areas, the median of which is short and narrow; the lateral areas wider, extending farther forward and bordering upper edge of opercle.

Dorsal fins separate, their bases short. Spinous dorsal greatly elevated; the spines slender and filamentous at tips; the second longest, its height $3\frac{1}{2}$ in length; the third a little longer than the first; the last about a third as long as the second. Soft dorsal high, the posterior rays longest; when depressed, the tip of fin just reaches bases of first caudal rays. Anal not so high as dorsal; the last ray inserted directly below that of dorsal; the fin, when depressed, falling far short of base of caudal. Caudal rounded posteriorly. Pectorals almost reaching a vertical through vent. Ventrals short, free from body posteriorly.

Color in alcohol, light brown; the tint not being uniform, but darker near the center of each scale; sides with four or five very indistinct large dark blotches. Fins a little darker than body, upper anterior edge of soft dorsal white; soft dorsal, anal, and caudal bordered with white, especially in the adult.

This description is of a male specimen collected at Tsushima by P. L. Jouy. Many other male specimens are like the one described. Others are somewhat lighter in color. There is some variation in the length of the fin rays.

Females have a shorter snout and smaller mouth; much lower and shorter fins, with the white borders narrow and indistinct. The females have 2 or 3 rows of small dark brown spots, 1 spot on each scale of upper part of body, and a very narrow lateral band of the same color, more distinct posteriorly, extending along the sides.

Specimens collected in Ishikawa Province by Prof. K. Kishinouye are very light in color, with darker spots on the sides; the spots absent

in some individuals. The fins are dark, having small brown spots arranged in lines. The occiput has a few small brown spots.

Several hundred specimens collected by us in Lake Biwa, at Matsubara, are light colored, with five or six large, dark, lateral spots. The dorsal, anal, and caudal fins have light borders. The white edgings of the dorsal are especially conspicuous in the larger specimens.

Fresh waters of Japan, from above Tokyo southward, everywhere very common; excessively abundant in Lake Biwa. It is one of the smallest gobies, being mature at 2 to 4 inches. Our specimens are from Ishikawa-ken, Lake Biwa, Tsushima, Nagasaki, Kurume, Kaga, Kana R., Kawatana, and Iyo.

(*Similis*, similar to *Otenogobius pflauri*.)

Measurements of Otenogobius similis.

Length in millimeters	75	73	69	70	69	66	60	60	54	60
Depth expressed in hundredths of length	18	17	21	20	19	20	20	18	18	19
Depth of caudal peduncle	14	13	14	14	14	14	13	13	13	13
Length of head	33	31	34	32½	31	32	28	28	28	29
Length of snout	15	13	16	14	13	14	12	10	11	11
Width of interorbital space	2½	2½	2½	2	2	2½	2	2	2	2½
Diameter of orbit	5½	6	6	5	6	6	7	6	6½	6
Distance from snout to spinous dorsal	42	41	44	43	43	42½	40	39	40	42
Distance from snout to soft dorsal	61	61	62	62	61½	63	62	61	61	62½
Height of longest dorsal spines	23	29	27	30	24	28	15	14	16	18
Height of longest dorsal rays	25	20	25	24	21	20	15	16	15	17½
Distance from snout to anal fin	65	64	66	66	65	66	66	66	65	65
Height of longest anal rays	17	15	16	17	15	15	15	16	14	15
Length of caudal peduncle	24	24½	24	23	24	24½	25	23	24	24
Length of caudal fin	26	26	26	26	25	26	24	25	24	26
Length of pectoral fin	25	23	24	24	23	23	26	25	24	26
Length of ventral fin	12	11	13	13	12	12	12	12	12	12
Number of dorsal spines	6	6	6	6	6	6	6	6	6	6
Number of dorsal rays	9	10	9	9	9	9	9	9	9	9
Number of anal rays	9	10	9	9	9	9	9	9	9	9
Number of pectoral rays	19	19	19	19	19	19	20	19	19	20
Number of scales in lateral series	31	31	30	31	29	29	28	32	31	33
Number of scales in transverse series	11	11	11	11	10	11	10	11	10	10
Locality, Tsushima.										

13. CTENOGOBIOUS GYMNAUCHEN (Bleeker).

Gobius gymnauchen BLEEKER, Act. Soc. Sci. Indo-Nederl., Japan, VI, p. 84, pl. 1, fig. 2, Tokyo.—GÜNTHER, Cat. Fish., III, 1861, p. 43 (after Bleeker).

Acentrogobius gymnauchen JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, Tokyo.

Head $3\frac{2}{3}$ in length; depth 6; depth of caudal peduncle $2\frac{4}{5}$ in head; eye $4\frac{1}{2}$; snout $4\frac{1}{2}$; maxillary $3\frac{1}{5}$; D. VI-10; A. 10; P. 16; scales in lateral series 26, in transverse series 7.

Body elongate; head about as deep as body, somewhat broader; eyes rather large, high up, directed laterally or somewhat obliquely; interorbital space narrow, slightly convex. Snout rather sharp, its upper outline more oblique than that of *C. pflauri*. Lower jaw slightly projecting. Mouth oblique. Maxillary concealed throughout, extending to a vertical through anterior edge of pupil. Teeth simple, in narrow bands on both jaws, outer row enlarged, the most posterior large tooth on each side of lower jaw strongly curved backward. Gill opening not extending far forward; isthmus broad, its width about

equal to length of snout. No papillæ on inner edge of shoulder girdle. Pseudobranchiæ large. Gill-rakers on first arch 3 + 9; slender.

Head naked; no barbels; a triangular naked space extending backward from occiput to insertion of dorsal; body elsewhere covered with large, finely ctenoid scales.

Dorsals separate; spines with filaments, the first and second very long and slender. Anal fin inserted below second dorsal ray, reaching posteriorly as far as the dorsal, both touching base of caudal. Pectorals and caudal rather pointed. Ventrals large, free posteriorly.

Color in spirits, light olive; throat with a narrow, longitudinal dark spot; sides of head and upper parts of body with dark spots, those near middle of sides arranged in an indefinite undulating line. Spinous dorsal with a wide, black edge; below this a broad band of pearly

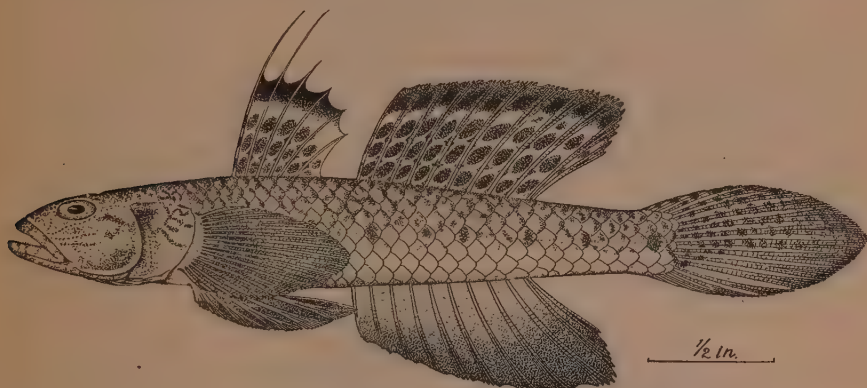


FIG. 6.—CTENOGOBIOUS GYMNAUCHEN.

white; basal half of fin with 3 rows of oval, dusky, or black spots; soft dorsal similarly colored. Caudal with small, dusky, oval spots on interradial membranes, except on lower parts of fin. Anal broadly edged with dusky. Pectorals dusky at base, the dark color fading out toward the edge. Ventrals streaked longitudinally with black. Described from a specimen from Enoshima.

Some individuals are much lighter in color. They have a more or less conspicuous dark blotch at base of caudal, and occasionally a row of 4 or 5 poorly defined small spots along the sides.

This small prettily colored goby is rather common in Japan, living chiefly in the estuaries about and under muddy rocks. Our numerous specimens are from Misaki, Wakanoura, Nagasaki, Tokyo Bay, Tsuruga, and Enoshima.

(γυμνός, naked; ἀντήν, nape.)

Measurements of Ctenogobius gymnauchen.

Length in millimeters.....	57	50	46	52	43
Depth expressed in hundredths of length.....	14	13 $\frac{1}{2}$	17	16	16
Depth of caudal peduncle.....	9	8	8	8	8 $\frac{1}{2}$
Length of head.....	26	26 $\frac{1}{2}$	26 $\frac{1}{2}$	27	28
Length of mouth.....	7	6 $\frac{1}{2}$	6 $\frac{1}{2}$	7	7 $\frac{1}{2}$
Length of maxillary.....	9 $\frac{1}{2}$	9 $\frac{1}{2}$	9	9 $\frac{1}{2}$	9
Width of interorbital space.....	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Diameter of orbit.....	6 $\frac{1}{2}$	6 $\frac{1}{2}$	6 $\frac{1}{2}$	7	7
Distance from snout to spinous dorsal.....	34	33	36	34	36
Distance from snout to soft dorsal.....	53	54	54	51	56
Height of longest dorsal spines <i>a</i>	37	21	23	33	14
Height of longest dorsal rays.....	27	27	21	25	15
Distance from snout to anal fin.....	55	56 $\frac{1}{2}$	54	55	57
Height of longest anal rays.....	25	22	17	23	14
Length of caudal peduncle.....	19	21	22	22	20
Length of caudal fin.....	28	31	28	27	26
Length of pectoral fin.....	26	25	22	24	23
Length of ventral fin.....	25	25	24	25	25
Number of dorsal spines.....	6	6	6	6	6
Number of dorsal rays.....	10	10	10	10	10
Number of anal rays.....	10	10	10	10	10
Number of pectoral rays.....	16	16	16	17	16
Number of scales in lateral series.....	28	24	26	25	27
Number of scales in transverse series.....	6	6	6	6	7
Locality, Tokyo.					

a Including filaments.

14. CTENOGOBIOUS HADROPTERUS Jordan and Snyder, new species.

Head $3\frac{1}{2}$ in length; depth $4\frac{1}{2}$; depth of caudal peduncle $2\frac{1}{2}$ in head; eye 4; snout $2\frac{3}{4}$; maxillary $2\frac{3}{4}$; D. VI-9; A. 9; P. 19; scales in lateral series 28; in transverse series 9.

Body robust, a little deeper than wide. Snout long and sharp. Eye high in head, the upper margin projecting above contour of head,



FIG. 7.—CTENOGOBIOUS HADROPTERUS.

directed obliquely, situated at a point halfway between tip of snout and posterior edge of opercle. Interorbital space narrow, concave. Nostrils minute, the anterior with a distinct tube. Mouth moderate, somewhat oblique. Jaws subequal, the lower slightly shorter; upper lip very wide; maxillary entirely concealed, not quite reaching a vertical through anterior edge of orbit. Tongue broad, the tip truncate. Teeth of jaws in 2 series, outer ones in a single row, small, canine-like, not firmly attached; second series in upper jaw very minute, in lower jaw a little smaller than the anterior ones; no large canines. Gill opening extending upward to edge of base of pectoral; width of isthmus about equal to length of snout. No papillae on inner edge of shoulder girdle. Gill-rakers small, 2 + 8 on first arch. No barbels on lower jaw.

Head, except occiput, naked; scales on occiput cycloid; those on body ctenoid, large and very regular; 5 lateral series on caudal peduncle; scales on breast anterior to the ventrals small, concealed in the thick epidermis.

Dorsal fins well separated, short; height of longest dorsal spine about equal to postorbital part of head; depressed spines not reaching the rays; dorsal rays a little longer than the spines; anal inserted below base of second or third ray of soft dorsal; rays equal in height to those of dorsal; both fins when depressed extending an equal distance posteriorly, their tips separated from bases of caudal rays a distance equal to length of snout. Caudal rounded, almost truncate. Pectoral acutely rounded, extending to a vertical through vent; upper rays without filamentous appendages. Ventrals long, not reaching vent, free posteriorly.

Color in spirits, pale olive gray; the sides with 6 conspicuous brownish black spots, the first and smallest at angle of opercle, the last at base of caudal; each spot, except the first and last, is connected with the one on the opposite side by 2 tolerably well-defined dark bands passing over the back; a narrow dusky band extending forward from eye parallel with dorsal outline of snout; cheek with wavy, oblique bars; occipital region with small, closely crowded blotches. Dorsal fins with dusky spots arranged in longitudinal rows; 3 rows on the first and 4 on the second fin, the outer row being very indistinct. Anal slightly tinged with dusky posteriorly. Caudal with a few very indistinct vertical wavy bands. Pectoral with a trace of dusky. Ventrals dark, the color in lines parallel with the rays.

Type No. 6449, Leland Stanford Junior University Museum. Locality, Nagasaki, Hizen.

Some of the cotypes are a little lighter in color.

We also have specimens from Kurume, Tsuruga, and Kawatana.

(*Hadropterus*, a genus of Etheostomine perch of similar habit; ἄδρὸς, strong; πτερόν, fin.)

Measurements of *Ctenogobius hadropterus*.

Length in millimeters.....	47	45	44	46	43	41	42	41	40	....
Depth expressed in hundredths of length.....	21	22	21	21	23	21	21	20	21	20
Depth of caudal peduncle.....	11	12	12	12	11	12	12	12	11	10
Length of head.....	30	30	28	30	30	30	30	30	29	30
Length of snout.....	12	12½	12	11	12	12	11	11	10	10
Width of interorbital space.....	2	2½	2½	2	2	2	2	2	2	2
Diameter of orbit.....	7	7	7	7½	7	7½	6½	7½	7	7½
Distance from snout to spinous dorsal.....	40	40	40	40	40	41	40	39	40	40
Distance from snout to soft dorsal.....	60	60	60	60	60	60	59	59	60	60
Height of longest dorsal spines.....	15	15	14	18	15	16	15	18	16	15
Height of longest dorsal rays.....	15	15	16	15	15	17	16	18	17	15
Distance from snout to anal fin.....	60	61	60	60½	59	60	60	60	61	60
Height of longest anal rays.....	14	14	14	15	14	15½	15	15	16	13
Length of caudal peduncle.....	26	26	26½	27½	27	27	27	27	27	28
Length of caudal fin.....	20	20	21	23	23	23	23	21	23	24
Length of pectoral fin.....	24	25	26	26	25	25	26	24	25	27
Length of ventral fin.....	20	20	21	21	20	22	20	21	23	21
Number of dorsal spines.....	6	6	6	6	6	6	6	6	6	6
Number of dorsal rays.....	9	9	8	9	9	9	9	9	9	8
Number of anal rays.....	9	9	9	8	9	8	9	9	8	9
Number of pectoral rays.....	19	19	19	19	19	19	19	20	19	19
Number of scales in lateral series.....	28	28	28	28	28	28	28	28	28	28
Number of scales in transverse series.....	9	10	9	9	9	9	9	9	9	9

15. CTENOGOBIOUS CAMPBELLI Jordan and Snyder, new species.

Head 4 in length; depth $5\frac{1}{2}$; depth of caudal peduncle $2\frac{1}{8}$ in head; eye $3\frac{3}{8}$; snout $3\frac{1}{2}$; maxillary $2\frac{3}{8}$; D. VI-11; A. 10; P. 18; scales in lateral series 26, in traverse series 9.

Body thickset; cylindrical anteriorly; the caudal peduncle deep. Snout short; blunt. Eye very large; the upper margin projecting slightly above dorsal contour of head; directed obliquely upward. Interorbital space narrow; concave. Mouth somewhat oblique. Maxillary entirely concealed; extending to a vertical through pupil. Lips narrow. Teeth simple; in narrow bands on both jaws; outer ones somewhat enlarged; no canines. Tongue narrow; truncate anteriorly. Gill openings not extending far forward; isthmus broad; its width equal to distance between tip of snout and middle of pupil. Inner edge of shoulder girdle with a sharp ridge but no papillae. Gill-rakers long and rather slender. Anterior nostril with a conspicuous tube. No barbels on lower jaw.

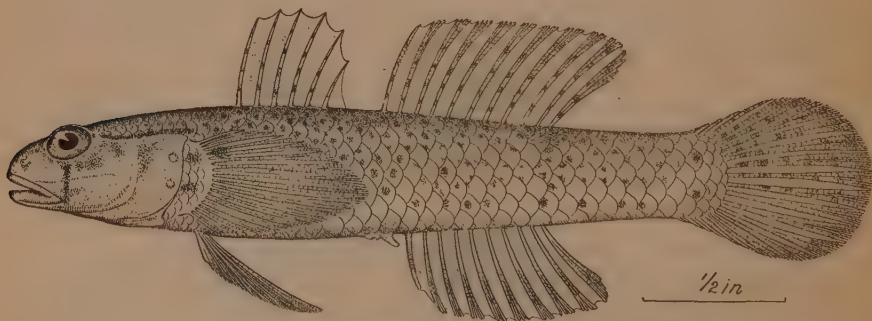


FIG. 8.—CTENOGOBIOUS CAMPBELLI.

Head naked, except on occiput. Body with large ctenoid scales; those on nape and occiput cycloid; smaller than those of body; those on breast anterior to ventrals and on region before pectorals cycloid.

Dorsals separate; spines when depressed not reaching insertion of soft dorsal. Anal inserted below base of second or third dorsal ray; reaching as far posteriorly when depressed as the dorsal; neither touching base of caudal. Caudal rounded. Pectoral pointed; its upper edge without free filaments. Ventrals free posteriorly, their tips reaching anal opening.

Body with small, round, dark spots; 5 or 6 very indefinite, narrow, dark, longitudinal bands. Head with small dark spots; those on nape arranged in longitudinal rows; a sharply defined, narrow, dark band running backward from eye; opercle with 2 small brown rings. Dorsal spines and rays with small, oblong, dark spots; caudal with small, dark spots on upper two-thirds; not evident on the lower part. Anal narrowly edged with white; suffused with dusky below the white,

growing lighter toward the base. Pectorals and ventrals suffused with dusky; a spot about as large as pupil on upper part of base of the former.

This species is probably closely related to *C. virgatulus* or to *C. pflaumi*. It more closely resembles the former, but may be easily distinguished from it by its much less oblique mouth and by having larger scales on the nape. In *C. virgatulus* the scales of the nape are minute when compared with those of the body, while on the species in hand they are at least one-half as wide as those of the body.

The species is at present known from a single specimen 81 millimeters long, from Wakanoura, Kii, Japan. Type No. 6450, Leland Stanford Junior University Museum.

Measurements.—Length, tip of snout to base of caudal, 65 millimeters; depth, expressed in hundredths of length, 18; depth of caudal peduncle, $11\frac{1}{2}$; length of head, $25\frac{1}{2}$; length of snout, $6\frac{1}{2}$; width of interorbital space, 1; diameter of orbit, 7; distance from snout to spinous dorsal, 33; distance from snout to soft dorsal, 54; height of longest dorsal spines $15\frac{1}{2}$, of longest dorsal rays $15\frac{1}{2}$; distance from snout to anal fin, 56; height of longest anal rays, 15; length of caudal peduncle 25, of caudal fin 25, of pectoral fin 26, of ventral fins 22.

This species is named for Dr. Douglas Houghton Campbell, professor of botany in Leland Stanford Junior University, in recognition of his interest in the flora of Japan and in all things Japanese.

16. CTENOGOBIOUS VIRGATULUS Jordan and Snyder, new species.

Head 4 in length; depth $5\frac{3}{8}$; depth of caudal peduncle 10; eye $3\frac{4}{5}$ in head; snout $3\frac{1}{2}$; maxillary 3; D. VI-11; A. 11; P. 16; scales in lateral series 26, in transverse series 9.

Body elongate, the dorsal and ventral contours sloping gradually from occiput posteriorly; caudal peduncle compressed, narrowest near the middle, widening somewhat toward base of caudal; head large, deeper and broader than body. Snout blunt. Eyes prominent, though smaller than those of *C. pflaumi*; directed obliquely, the upper edges projecting above dorsal contour of head; interorbital area very narrow. Mouth oblique, lower jaw slightly projecting. Maxillary entirely concealed, extending posteriorly to anterior edge of orbit. Tongue broad at tip, with a shallow notch. Teeth of jaws in narrow bands, simple, the outer ones enlarged; those near middle on upper jaw largest; a pair of short, strong canines on each side of lower jaw, the posterior one being larger, strongly curved backward. Gill openings not extending far forward; the isthmus broad; inner edge of shoulder girdle without papillæ. Pseudobranchiæ consisting of 6 large projecting tufts. Gill-rakers on first arch about $3+8$; those of upper limb represented by minute elevations; those of the lower limb rather long and slender. No barbels on chin.

Head, except a small occipital area, naked; a large pore above and between the nostrils; 2 similar pores on interorbital area; a row of 3 running backward from the eye; sides of head with rows of minute pores. Body covered with large, weakly ctenoid scales, the rough edges of which are hidden by epidermis; scales on nape and occipital area very small.

Dorsal fins separate; spines slender, the first 5 evenly spaced; the interval between fifth and sixth twice that between two of the others; spinous dorsal, when depressed, reaching past insertion of soft dorsal. Anal inserted below second or third dorsal ray, the fin extending slightly farther posteriorly than the dorsal, neither reaching base of caudal. Caudal acutely rounded. Pectoral without filaments on upper edge. Ventrals free posteriorly, extending as far backward as do the pectorals.

Color in spirits much darker above than below, the sides with 5 narrow, dark, longitudinal streaks; a median row of indistinct, large, dark spots, the one at base of caudal being most prominent; cheeks



FIG. 9.—CTENOGOBIOUS VIRGATULUS.

with 1 or 2 dark lines; opercle with a large dark blotch; scales of breast each with a subdued dusky spot. Spinous dorsal dusky, with a narrow longitudinal band, the posterior part widened, forming a distinct oval spot; soft dorsal dusky, each ray with 3 indistinct spots; caudal rays with small, dusky spots arranged in vertical rows; spots on lower fourth of fin very indistinct or absent; ventrals and anal dusky; pectoral dusky, with an elongate dark spot at upper part of base and a narrow dark dash on the lower edge.

Type.—No. 6451, Leland Stanford Junior University Museum. Locality, Misaki, Sagami, Japan.

Many specimens from Misaki are lighter in color than the type, a highly colored male; on the lighter one the bands and spots are much more distinct.

Individuals from Nagasaki have the color pattern in every detail, as described above, although it is much lighter and less distinct.

The species is closely related to *C. pflaumi*. It may be distinguished by its smaller eyes and by the absence of a long, dark blotch on chin and throat.

This species is found with *Ctenogobius pflaumi*, and equally common, in the bays and inlets of southern Japan. We have specimens from Misaki, Wakanoura, Nagasaki, Tokyo Bay, Matsushima, Onomichi, and from Semida R., near Tokyo.

(*Virgatus*, finely streaked.)

Measurements of Ctenogobius virgatus.

	Misaki, Sagami.				Nagasaki, Hizen.		
Length in millimeters.....	65	65	60	52½	58	50	50
Depth expressed in hundredths of length.....	17	17	18	17	18	20	18
Depth of caudal peduncle.....	10	10	10	10	12	11	10
Length of head.....	25	25½	26½	27	25	25	24
Length of snout.....	7½	7	7	7	6	6	6
Length of maxillary.....	9	10	9	9	9½	10	9
Width of interorbital space.....	½	½	½	½	½	½	½
Diameter of orbit.....	7	6½	6½	7	6	7	6½
Distance from snout to spinous dorsal.....	35	35	33	35	33	35	35
Distance from snout to soft dorsal.....	54	53	52	54			
Height of longest dorsal spines.....	15	13	8	14			
Height of longest dorsal rays.....	13	15	7	14			
Distance from snout to anal fin.....	59	59	55	57	55	57	58
Height of longest anal rays.....	14	20	17	13			
Length of caudal peduncle.....	20	20	19	21			
Length of caudal fin.....	22	23	25	22			
Length of pectoral fin.....	22	22	21	21	28	28	24
Length of ventral fin.....	22	21	22	21	24	25	24
Number of dorsal spines.....	6	6	6	6	22½	22	21½
Number of dorsal rays.....	11	11	11	11	6	6	6
Number of anal rays.....	11	11	11	11	11	11	11
Number of pectoral rays.....	16	17	16	16	11	11	11
Number of scales in lateral series.....	26	26	27	26	26	26	27
Number of scales in transverse series.....	9	9	9	9	8	9	8

a The last dorsal and anal rays are cleft to the base.

17. CTENOGOBIUS PFLAUMI (Bleeker).

Gobius pflaumi BLEEKER, Verh. Bat. Gen., XXV, Japan, p. 42, figs. 3, 18, Nagasaki.
Acentrogobius pflaumi JORDAN AND SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372,
 near Tokyo. Coll. Kishinouye.

Head 4 in length; depth 4½; depth of caudal peduncle 11; eye 3½ in head; length of snout 3½; maxillary 2½; D. VI-11; A. 11; P. 17; scales in lateral series 26, in transverse series 9.

Body elongate, the dorsal and ventral contours sloping gradually from occiput to caudal peduncle; caudal peduncle narrowest near the middle, widening somewhat toward base of caudal. Head about as deep and broad as body. Snout rather blunt, the lower jaw slightly projecting. Eyes very large, directed obliquely upward, the upper edges of orbit projecting slightly above contour of head; interorbital space narrow; concave. Mouth oblique. Maxillary entirely concealed, extending posteriorly to a vertical through anterior edge of orbit. Tongue broad at tip; truncate. Teeth of jaws in narrow bands; simple; the outer ones enlarged; a pair of short, strong canines on each side of lower jaw, the posterior one being larger and curved backward. Gill openings not extending far forward; the isthmus broad. Gill-rakers 2 + 8; those of the upper arch much reduced; the lower ones slender. Inner edge of shoulder girdle without papillæ. No barbels on chin.

Head, except occipital area, naked. A large pore above and between the nostrils; 2 similar pores on interorbital area; a row of 3 running backward from the eye; sides of head with rows of minute pores. Body covered with large weakly ctenoid scales; those of nape and occipital area very small.

Dorsal fins separate; spines slender, the first 5 evenly spaced; the interval between fifth and sixth about double that between 2 of the others; spines when depressed reaching beyond insertion of soft dorsal. Anal inserted below second or third dorsal ray, the fin, when depressed, extending slightly further posteriorly than the dorsal, both falling short of base of caudal. Caudal acutely rounded. Upper edge of pectoral without free filaments. Ventrals free posteriorly, extending about as far backward as the pectorals.

Body olivaceous, with dark markings; head blue in life.

Scales on upper parts, with dusky margins; sides with 2 or 3 faintly outlined dark stripes; a median row of 4 or 5 indistinct dusky spots; a distinct, round, black spot about as large as eye at base of caudal; a small dark spot on lower part of opercle; branchiostegal region of throat dusky. Fins dusky, but without conspicuous markings.

Southern Japan, generally common in the bays and inlets, in salt water; here described from specimens collected at Tsuruga, Echizen. Others are in the collection from Yokohama, Wakanoura, Aomori, Matsushima, Onomichi, Kobe, Owari Bay, and from Kawatana.

This species very closely resembles *Ctenogobius virgatus*. It differs in having much larger eyes, an oblong black blotch on branchiostegal region, and in having the general color of body much lighter.

Measurements of Ctenogobius pflaumi.

	Tsuruga, Echizen.				Nagasaki, Hizen.		
Length in millimeters.....	56	54	57	56	55	47	55
Depth expressed in hundredths of length.....	19	19	17	21	17	19	18
Depth of caudal peduncle.....	9	10	10	10	10	11	9
Length of head.....	26	25½	25	26	27	26	25
Length of snout.....	7	6	6	7	7	6	6½
Length of maxillary.....	10	11	10	10	10	9½	10
Width of interorbital space.....	½	½	½	½	½	½	½
Diameter of orbit.....	8	7½	8	8½	8	8	7½
Distance from snout to spinous dorsal.....	35	34	35	34	33	33	34
Distance from snout to soft dorsal.....	55	52	53	51	51	52	53
Height of longest dorsal spines.....	16	14	15	16	14	14	14
Height of longest dorsal rays.....	14	19	17½	17	18	16	14
Distance from snout to anal fin.....	60	56	56½	58	57	55	56
Height of longest anal rays.....	14½	18½	18	17	18	19	16
Length of caudal peduncle.....	20	19	19	20	22	20	21
Length of caudal fin.....	26	27	29	30	22	32	29
Length of pectoral fin.....	25	24	26	24	24	25	25
Length of ventral fin.....	20	19	22	22	19	22	22
Number of dorsal spines.....	6	6	6	6	6	6	6
Number of dorsal rays α.....	11	11	11	11	11	11	11
Number of anal rays α.....	10	11	11	11	11	11	11
Number of pectoral rays.....	16	17	16	17	17	17	17
Number of scales in lateral series.....	25	25	25	26	25	25	26
Number of scales in transverse series.....	8	9	9	8	8	8	9

α The last dorsal and anal rays are cleft to the base.

11. ABOMA Jordan and Starks.

Aboma JORDAN and STARKS, Proc. Cal. Ac. Sci., 1895, p. 497 (*etheostoma*).

This genus is very closely allied to *Otenogobius*, differing chiefly in the presence of 7 or 8 dorsal spines; head naked, rounded in profile, narrow and not depressed between eyes; mouth moderate, not very oblique, the chin usually not prominent; outer teeth somewhat enlarged; tongue not notched. Scales usually large, etenoid, sometimes rather small. Dorsals and anal short; no flaps on shoulder girdle; no silk-like rays on pectoral.

Species numerous, small in size and mottled in coloration, mostly Japanese, three of them from the west coast of Mexico.

(*Aboma*, Spanish name of the small gobies in Mexico.)

- a. Scales large, 30 to 45 in longitudinal, 9 to 12 in transverse series; breast naked.
- b. Ventral fins dusky, with a bright yellow, broad median stripe; depth $4\frac{1}{2}$ in length; scales 36-10; coloration rather bright; caudal with zigzag bands above, plain below.....*lactipes*. 18
- bb. Ventral fins plain; coloration rather obscure; caudal spotted above, plain below.
- c. Scales large, 9 in transverse series; depth $5\frac{1}{2}$ in length; a faint caudal spot.....*tsushimæ*. 19
- cc. Scales smaller, 12 in transverse series; no caudal spot; first dorsal with a black spot with white before it.....*heptacantha*. 20
- aa. Scales small, 15 to 20 in transverse series (probably 60 to 70 in longitudinal series).
- d. Scales in cross series 15; anal rays 10 or 11; caudal translucent, with fine dots.....*breunigi*. 21
- dd. Scales in cross series 20; anal rays 12 or 13; caudal with a median cross band always present.....*urotania*. 22

18. ABOMA LACTIPES (Hilgendorf).

Gobius lactipes HILGENDORF, Sitzber. Naturf. Freunde, 1878, p. 109, Tokyo; No. 10650, Mus. Berlin.

Aboma lactipes JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, Tokyo, Tōnegawa.

Head $3\frac{3}{4}$ in length; depth $4\frac{1}{2}$; depth of caudal peduncle 10; eye $5\frac{1}{2}$ in head; snout $2\frac{3}{4}$; maxillary $2\frac{1}{4}$; D. VIII-11; A. 11; P. 18; scales in lateral series 36, in transverse series 10.

Body cylindrical anteriorly, sloping gradually to the rather deep caudal peduncle. Head large; snout long; blunt. Eyes small; situated high up; nearer to tip of snout than to posterior edge of opercle a distance equal to one-half the diameter; directed almost laterally. Mouth almost horizontal; jaws equal; upper lip wide; maxillary concealed except at distal end; reaching a vertical passing midway between anterior edge of orbit and pupil. Teeth simple; in a narrow band on each jaw; outer ones but little enlarged. Tongue rather broad; its anterior edge truncate or slightly rounded. Gill openings restricted to the sides; width of isthmus a little less than length of snout. Inner

edge of shoulder girdle with a low, narrow, sharp ridge, but no papillae. Gill-rakers 1 + 7; short; flat. Anterior nostrils with low tubes. No barbels on lower jaw.

Head naked. Body with large, finely ctenoid scales; those on sides of nape small; middle of nape, breast anterior to ventrals and region before pectorals naked.

Dorsals separate; spines and rays of about equal height; the spinous dorsal when depressed reaching insertion of soft dorsal. Anal inserted below base of second dorsal ray; the rays a little shorter than those of dorsal; when depressed, reaching almost as far posteriorly as do those of dorsal; neither reaching bases of caudal rays. Caudal rounded. Pectorals rather pointed; the upper border without free filaments. Ventrals very large, extending to anal opening; free posteriorly.

In spirits the upper part of the body suffused with dusky; sides with 9 rather definite, dark vertical bands, extending from a little

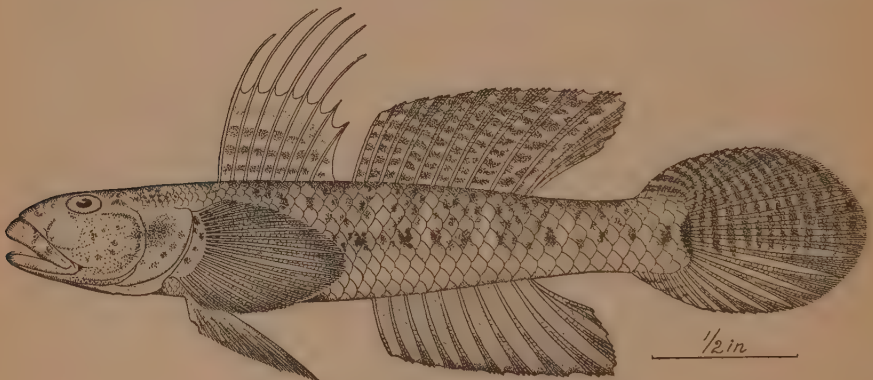


FIG. 10.—*ABOMA LACTIPES*.

below the middle of body upward; darker near their lower edges. Head dark; a narrow blackish line running from eye to tip of maxillary; under parts without dusky, except on throat and chin. Spinous dorsal edged with white; interradiat membranes dusky; jet black on upper posterior part of fin; soft dorsal with small, oblong, dark spots arranged in rows. Upper two-thirds of caudal with vertical, zigzag bands; the lower third dusky; without bands. Anal dark; narrowly bordered with white; pectoral dusky. Ventral with a white, median area broadly bordered with black.

Color in life, lemon yellow; middle area of ventrals bright yellow, slightly tinged with orange; spinous dorsal edged with orange; anal with a narrow marginal band of dead white.

The above description is of a specimen from the bay at Tsuruga. Other individuals from the same locality are like it except in color. In some the lateral bands are very indistinct, the sides being covered with small dusky spots. Others are much lighter, the general color-

pattern being preserved however. A large male specimen has a series of narrow, bright, transverse lateral bands on the sides. The soft dorsal is distinctly edged with white. Occasionally in males the anterior spines of the first dorsal have very long filaments extending above the margin of the fin.

The species is generally common in the bays of Hondo. Our many specimens are from Matsushima, Aomori, Tokyo, Tsuruga, Enoshima, and the Tone River, near Tokyo.

(*Lac, lactis*, milk; *pes*, foot.)

Measurements of Aboma lactipes.

Length in millimeters	72	72	66	56	48
Depth expressed in hundredths of length	22	22	22½	21	21
Depth of caudal peduncle	10½	10	9½	10	10
Length of head	27	27	26	27½	28
Length of snout	10	10	10	11	11
Width of interorbital space	2	2½	2	2	2
Diameter of orbit	5½	5½	5	6	6
Distance from snout to spinous dorsal	34	34	34	35	36
Distance from snout to soft dorsal	56	55	55	55	57
Height of longest dorsal spine	16	15	15	15	15
Height of longest dorsal rays	17	15½	16	15½	16
Distance from snout to anal fin	56	57	60	58	59
Height of longest anal rays	15	14	13	14	16
Length of caudal peduncle	22	23	22	22	23
Length of caudal fin	24	24	25	26	25
Length of pectoral fin	22	23	23	24	25
Length of ventral fin	24	25	22	27	25
Number of dorsal spines	8	8	8	8	8
Number of dorsal rays	11	12	11	12	11
Number of anal rays	11	11	10	11	11
Number of pectoral rays	18	18	18	18	18
Number of scales in lateral series	36	37	35	35	35
Number of scales in transverse series	10	10	9	9	9
Locality, Tsuruga.					

19. ABOMA TSUSHIMÆ Jordan and Snyder.

Aboma tsushimæ JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 759, Sasuna, Tsushima, Japan.

Head $3\frac{1}{2}$ in length; depth $5\frac{3}{5}$; depth of caudal peduncle $2\frac{3}{4}$ in head; eye $\pm$; snout $3\frac{1}{3}$; maxillary $2\frac{3}{5}$; D. VIII-12; A. 11; P. 17; scales in lateral series 33, in transverse series 9.

Body not notably elongate; gradually diminishing in size from the region of pectoral fins backward. Head as wide as body, but less deep. Snout very blunt; rounded when viewed from above; truncate when seen from the side.

Eyes high in head; directed obliquely upward; interorbital space very narrow. Jaws subequal, the lower slightly included. Mouth rather small; the cleft somewhat oblique. Lips large. Maxillary, except the tip of the distal end, concealed; extending to a vertical through anterior edge of orbit. Space between orbit and maxillary about equal to longitudinal diameter of eye. Tongue broad; rounded anteriorly; its free edge narrow. Teeth simple; in narrow bands on jaws; outer ones largest, slender, sharp, slightly curved; the ones on sides of lower jaw enlarged, though not notably so, there being no strong canines. Gill opening not extending far forward; the width of

isthmus about equal to length of maxillary. Inner edge of shoulder girdle projecting as a sharp ridge, without papillæ or other dermal modifications. Gill-rakers on first arch, 2 + 7 or 8; short and pointed. Anterior nostril with a high rim. No barbels on jaw.

Head naked. Body with large, finely ctenoid scales; the region immediately anterior to pectorals, the breast in front of ventrals, and a narrow space extending backward nearly to vent naked.

Dorsal fins separate from each other and from the caudal; second spine highest; the others successively shorter; when depressed, just reached origin of soft dorsal. Dorsal rays, when depressed, falling far short of base of caudal. Anal inserted directly below base of third dorsal ray; the rays somewhat longer posteriorly, when depressed extending as far back as the dorsal. Pectorals pointed; their tips reaching a vertical through insertion of soft dorsal; the upper rays not peculiar. Ventrals long; not extending so far posteriorly as pectorals; free from body except at base.

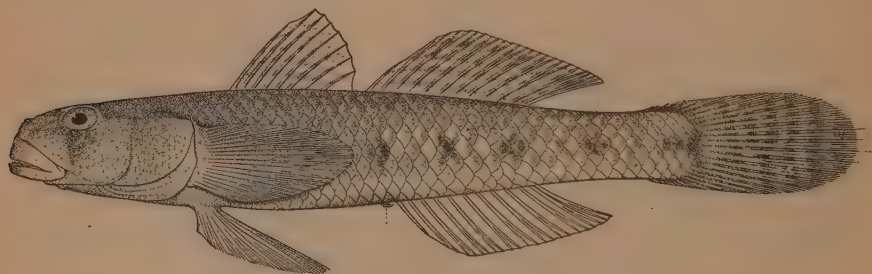


FIG. 11.—*ABOMA TSUSHIME*.

Color in alcohol light-brownish, everywhere with small, indistinct darker spots and reticulations; sides with 6 or 7 poorly defined lateral spots, the last and most conspicuous one at base of caudal fin. Dorsals with markings of light brown, arranged in longitudinal rows on the membranes; similar marks assembled in wavy lines on the rays of upper three-fourths of caudal; the lower part of fin without spots. Other fins somewhat dusky.

Specimens smaller than the type have the dark marking a little more distinct.

Known only from specimens collected at Sasuna, on the island of Tsushima, Japan, by P. L. Jouy.

20. *ABOMA HEPTACANTHA* (Hilgendorf).

Gobius heptacanthus HILGENDORF, Sitzber. Natur. Freunde, 1878, p. 110, Tokyo; No. 10656, Mus. Berlin.

Head $4\frac{1}{2}$ (with caudal); depth $6\frac{1}{2}$; D. VII-12; A. 12; scales in 12 rows between dorsal and anal. Eye equal to snout and to interorbital width, 4 in head. Profile of head nearly straight; lower jaw projecting; mouth large, the maxillary reaching posterior border of eye;

teeth in several rows, the outer larger; scales of body ctenoid, each with about 10 little teeth; a pair of large pores in posterior part of interorbital space; pectoral without silky rays.

Color clear violet brown with darker net-like marbling; throat dark brown; first dorsal with a black spot with white below it, and a brown band forward and downward; second dorsal with about 5 oblique bands; anal with dark margin especially behind; pectoral colorless; ventral and caudal dusky with fine points; no spot on base of caudal.

Bay of Tokyo. (Hilgendorf.) Not seen by us.

(ἐπτά, seven; ἄκανθα, spine.)

21. ABOMA BREUNIGI (Steindachner).

Gobius breunigi STEINDACHNER, Ichth. Beitr., VIII, 1879, p. 22, Hakodate.

Head 4; depth $5\frac{2}{3}$ (with caudal); eye $4\frac{3}{4}$ in head; snout $4\frac{1}{3}$; D. VII–I, 11; A. 10 or 11; P. 20 or 21; scales 60 to 62–15; snout $4\frac{1}{3}$ in head.

Body slender, compressed; scales ctenoid; head naked; jaws subequal; maxillary reaching to opposite front of eye; teeth small, those of the outer row longest. Dorsal spines low, slender, the fourth about 2 in head, not so high as body, a little lower than soft dorsal. Caudal a little shorter than head. Pectorals shorter than head, without silky rays; as long as ventrals. Reddish brown above, pale below, a dark stripe from eye to side of snout; dark brown close set spots forming narrow zigzag streaks on upper part of head and body; often a small dark spot at base of pectoral above; behind this dark cross streaks; both dorsals and caudal translucent with dark spots and fine dots.

Length 60 mm. Hakodate; not found by us. (Steindachner.)

Named for Dr. Ferdinand Breunig, professor of natural history in the Imperial Gymnasium at Schotten.

22. ABOMA UROTÆNIA (Hilgendorf).

Gobius urotænia HILGENDORF, Sitzber. Nat. Freunde, Berlin, 1878, p. 108, Tokyo; No. 10644, Mus. Berlin.

Head $3\frac{2}{3}$; depth $5\frac{1}{2}$; D. VI or VII–12 or 13; A. 12 or 13; scales 20 in cross series. Eye $4\frac{1}{2}$ in head, scarcely less than snout; depth of head 2 in head, breadth $2\frac{2}{3}$; interorbital width equal to vertical diameter of eye; lower jaw projecting; teeth in several rows, the outer larger; rays of dorsal not produced; profile of head very weakly convex; head scaleless; scales of body ctenoid, each with 7 to 9 teeth on the edge.

Color clear brown, with irregular darker spots, those along lateral line mostly rhombic, a distinct spot at base of caudal; a horizontal streak before eye; a dark streak along caudal peduncle above and below; caudal with a well-marked median cross band constantly present; a fainter band near the edge. Spinous dorsal with one, anal with two, distinct bands.

Bay of Tokyo; known from small examples about 37 mm. in length. (Hilgendorf.) Not seen by us.

(οὐρά, tail; ραβία, ribbon.)

12. CRYPTOCENTRUS Ehrenberg.

Cryptocentrus (Ehrenberg Ms.) BLEEKER, Arch. Néerl., IX, 1874, p. 322 (*cryptocentrus*).

Paragobius BLEEKER, *vide* BLEEKER, Arch. Néerl., IX, 1874, p. 322.

Body moderately elongate, covered with minute cycloid scales. Head compressed, narrow above and convex in profile, the eyes close together. Mouth large, oblique, the thick chin prominent; tongue narrow, not notched; teeth rather strong; no barbels; lower jaw not moving readily, so that the mouth is not easily opened wide; head naked. Dorsals short, the first of six spines, which are sometimes produced in filaments in the male; caudal pointed; ventrals rather long; pectorals without silky rays; no filaments on the shoulder girdle; isthmus very narrow; the gill membranes somewhat continued forward below.

Species brightly colored; rather numerous in the seas of the East Indies. The Japanese species differs from the type in the elevation of the dorsal spines.

(*κρυπτός*, hidden; *κέντρον*, spine, from a concealed projection on the preopercle in *C. cryptocentrus*.)

23. CRYPTOCENTRUS FILIFER (Cuvier and Valenciennes).

Gobius filifer CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, 1837, p. 106. ("Mer des Indes.")

Gobius knutteli BLEEKER, Act. Soc. Sci. Indo-Nederl., III, Japan, p. 16, pl. 1, fig. 2, Nagasaki.—GÜNTHER, Cat. Fish., III, p. 73, Hongkong.

Head $3\frac{3}{5}$ in length; depth $5\frac{1}{2}$; depth of caudal peduncle $2\frac{1}{5}$ in head; eye 5; snout $4\frac{1}{2}$; maxillary $1\frac{5}{8}$; D. VI-11; A. 10; P. 18; scales in lateral series about 95, in transverse series about 35.

Body deepest at insertion of spinous dorsal, from where it grows gradually smaller to the caudal peduncle. Head large; snout about equal to diameter of eye; blunt, rounded. Eyes small; not directed upward; interorbital space narrow; convex. Mouth large, oblique; jaws equal; lips thick; no barbels; maxillary entirely concealed; extending posteriorly far beyond eye to a point midway between tip of snout and posterior border of opercle. Teeth of jaws in broad bands; the outer row much enlarged and canine-like; curved backward; a large canine on each side of lower jaw; pharyngeal teeth bristle-like. Gill opening extending far forward below; the isthmus narrow, extending upward slightly above base of pectoral. Gill-rakers short, slender; 11 on lower limb of first arch; represented on upper limb of arch by 3 small papillæ. Inner edge of shoulder girdle without papillæ. Head naked; skin on interorbital area, snout, and suborbital loose, wrinkled and folded; body behind nape with minute cycloid scales, deeply embedded anteriorly, where their position is

indicated by shallow pits; larger and more evident posteriorly. Lateral line represented by a series of 15 or more vertical rows of minute pores, the rows separated by a space about equal to the diameter of eye.

Dorsals well separated; the spines, except the last, long and filamentous; when depressed reaching almost to base of last ray; soft dorsal low; posterior rays longest, their height about equal to depth of body. Anal inserted below third or fourth dorsal spine, the rays a little higher than those of dorsal; when depressed, extending as far posteriorly as do the dorsal, both fins reaching base of caudal. Caudal and pectorals sharply rounded posteriorly, the latter extending to a vertical through last dorsal spine; without filaments on its upper edge; ventrals reaching a vertical through insertion of second dorsal; free posteriorly.



FIG. 12.—CRYPTOCENTRUS FILIFER.

In spirits the color is brown, a little darker above than below; sides with 5 broad, vertical brown bands, having narrow, indistinct ones between them, the second of the wide bands located below the space between dorsals, the last at base of caudal; head, except lower jaw, dark; cheeks and opercle with small, pearly white spots (bright blue in life), surrounded by narrow, brownish rings. Fins dusky; the first dorsal with an elongate black spot on lower part of membrane between first and second spines, the spot preceded and followed by a narrow strip of white; membranes of anal bluish white; interradial membranes of caudal bluish white, the upper half with elongate white (blue) spots; pectorals lighter than the other fins; two inner rays of ventrals darker than the outer ones.

Coasts of southern Japan and China; living near the surface in open water or about rocks; generally common. Here described from a specimen 95 millimeters long from Nagasaki. Our numerous speci-

mens are from Tokyo, Tsuruga, Wakanoura, Kobe, Onomichi, and Nagasaki.

(*Filum*, thread; *fero*, bear).

13. GLOSSOGOBIUS Gill.

Glossogobius GILL, Ann. N. Y. Lyc. N. H., VII, 1859, p. 46 (*Platz cephalus*).

From *Chaenogobius*, with which genus the affinities are most close, *Glossogobius* differs mainly in the large size of the scales, which number about 31 in the lateral series.

This genus is less closely allied to *Ctenogobius*, from which it differs in the larger mouth, the strongly projecting chin, the deeply emarginate tongue, and in the narrow isthmus, the gill openings being extended considerably farther forward than in *Ctenogobius*. Head naked; depressed anteriorly. Teeth moderate, in broad bands; the inner teeth depressible; pseudobranchiæ well developed; no fleshy flaps on shoulder girdle; scales rather large, weakly ctenoid; dorsal fins both short, the first of six slender spines.

Species few, one of them a large goby common in the streams of Japan.

($\gamma\lambda\omega\sigma\sigma\alpha$, tongue; *Gobius*.)

24. GLOSSOGOBIUS BRUNNEUS (Schlegel).

Gobius brunneus SCHLEGEL, Fauna Japonica, p. 142, 1847, pl. LXXIV, fig. 2, Nagasaki.—GÜNTHER, Cat. Fish., III, p. 65; after Schlegel.—ISHIKAWA, Cat. Fish., 1897, p. 39, Tokyo, Boshu.

Gobius olivaceus SCHLEGEL, Fauna Japonica, p. 143, 1847, pl. LXXIV, fig. 3, Nagasaki, on a drawing by Bürger.—BLEEKER, Verh. en Meded. cft. Natuurk., 1867, p. 245, Jedo.

Head $3\frac{1}{2}$ in length; depth $4\frac{1}{2}$; depth of caudal peduncle 3 in head; eye $5\frac{3}{8}$; snout 3; maxillary $2\frac{1}{8}$; D. VI-10; A. 9; P. 20; scales in lateral series 30, in transverse series 10.

Body thickest; cylindrical; caudal peduncle deep; somewhat compressed; dorsal contour considerably arched; its highest point near insertion of spinous dorsal. Head very large; broader than body but less deep; snout rather pointed; broadly rounded when viewed from above. Eye small; directed laterally; interorbital space flat; distance between eyes equal to their vertical diameter. Mouth oblique; maxillary concealed; extending to a vertical through middle of orbit; lips broad; lower jaw projecting beyond the upper. Teeth simple; in 2 series; the outer ones somewhat enlarged; in a single row near edge of jaw, the inner ones depressible; in a narrow band. Tongue broad; deeply notched. Gill openings running far forward below; width of isthmus about equal to space between eyes. Inner edge of shoulder girdle without papillæ. Gill rakers on first arch 3 + 10; very short and flat; reduced to mere elevations near ends of arch. Anterior nostril with a tube. Chin without barbels.

Head naked except on occiput. Body with large, finely ctenoid scales; those on nape and breast minute.

Dorsal fins separate; anterior spines highest; the second with a short, filamentous tip; the fin when depressed just reaching insertion of soft dorsal; dorsal rays a little shorter than the spines. Caudal rounded. Anal inserted below base of second or third dorsal rays; its posterior rays longest; reaching almost as far backward as do those of dorsal; both falling short of base of caudal. Pectoral rounded; the upper edge without free filaments. Ventrals free posteriorly, the disk very broad.

Upper parts dark; sides with 4 or 5 large dark spots. Dorsal fins with small dusky spots in more or less definite longitudinal rows, the spots on anterior part of spinous dorsal large and black. Pectorals and caudal with small dark spots arranged in vertical rows. Ventrals and anal edged with white.

Described from an individual from Wakanoura. Specimens from Onomichi are a little lighter in color. On the nape and along the back are scattered small spots of a deep brownish black. This large goby is common in the streams and estuaries of southern Japan. Our numerous specimens are from Hakodate, Onomichi, Kurume, Nagasaki, and Wakanoura. This species is closely related to the Chinese goby *Glossogobius giuris*.

(*Brunneus*, brown.)

Measurements of Glossogobius brunneus.

	Nagasaki, Hizen.			Wakanoura, Kil.	
Length expressed in millimeters.....	141	119	106	112	82
Depth expressed in hundredths of length.....	20	22	20	21	18
Depth of caudal peduncle.....	12	11½	10½	11	11
Length of head.....	29	30	30	32	29½
Length of snout.....	10	10	9½	10½	9
Length of maxillary.....	13½	13	13	14	13
Width of interorbital space.....	3½	3½	3	3½	3
Diameter of orbit.....	5	5½	5½	6	5½
Distance from snout to spinous dorsal.....	36	39	37½	35	36
Distance from snout to soft dorsal.....	56½	58	58	58½	57½
Height of longest dorsal spines.....	15½	14	15	19	16
Height of longest dorsal rays.....	18½	12½	15	15	13
Distance from snout to anal fin.....	59½	62½	61	61½	61
Height of longest anal rays.....	17	12	15	15½	13½
Length of caudal peduncle.....	24	23½	25	23½	22
Length of caudal fin.....	26	22½	24½	26	26
Length of pectoral fin.....	24	23	23	25	24
Length of ventral fin.....	20	19	20	20	20
Number of dorsal spines.....	6	6	6	6	6
Number of dorsal rays.....	10	10	10	10	10
Number of anal rays.....	9	9	9	9	9
Number of scales in lateral series.....	32	31	31	30	30
Number of scales in transverse series.....	10	10	11	10	12

14. CHÆNOGOBIUS GILL.

Chænogobius GILL, Ann. Lyc. Nat. Hist. N. Y., 1859, p. 12 (*annularis*).

Gymnogobius GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 269 (*macrognathos*, based on specimens wrongly described as scaleless).

Body rather elongate; the head broad and depressed anteriorly; mouth large, oblique, the lower jaw projecting; teeth moderate, in

bands; tongue emarginate; sides of head naked; no barbels; eyes well separated; isthmus very narrow, the gill opening continued forward below. Scales very small, cycloid or weakly ctenoid; dorsal fins short, the first of 6 slender spines; ventrals moderate, not adnate; caudal short.

Gobies of moderate size abounding in the rivers of Japan. This genus differs from *Otenogobius* in the large mouth, notched tongue, wide gill openings, and very small scales.

Not having seen the type of *Chænogobius*, we are not quite sure of its identity with *Gymnogobius*.

(χαίρω, yawn; *Gobius*.)

a. Dorsal rays VI-9; anal 9; scales small; ocellate spots about the vent.

annularis, 25.

aa. Dorsal rays VI-12; anal 12; scales 70; body and fins finely dotted, the caudal with zigzag vertical bands.....*macrognathos*, 26.

25. CHÆNOGOBIUS ANNULARIS Gill.

Chænogobius annularis GILL, Ann. Lyc. Nat. Hist. N. Y., 1859, p. 12, Hakodate.
Gobius annularis GÜNTHER, Cat. Fish., III, p. 65; after Gill.

Head 4 in length; eye 4 in head; D. VI-9; A. 8.

Body cylindrical anteriorly; compressed posteriorly. Head broader than deep. Eye located anteriorly; 4 in head; directed obliquely. Interorbital space three-fifths diameter of eye. Mouth somewhat oblique; jaws equal. Scales small cycloid. Color brownish; dotted above with blackish; several ocellate spots about the vent; second dorsal with 3 bands. (Gill.)

Hakodate, island of Hokkaido. Not seen by us.

(*Annularis*, having rings.)

26. CHÆNOGOBIUS MACROGNATHOS (Bleeker).

Gobius macrognathos BLEEKER, Act. Soc. Sci. Indo-Nederl., VI, Japan, p. 83, pl. I, fig. 1, Rivers of Jeddo near Tokyo.

Gobiosoma macrognathos GÜNTHER, Cat. Fish., III, 1861, p. 86, after Bleeker.

Chænogobius macrognathos JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, Tokyo, Lake Biwa.

Head $3\frac{2}{5}$ in length; depth $4\frac{2}{3}$; depth of caudal peduncle $2\frac{3}{5}$ in head; eye 6; snout 3; maxillary $1\frac{1}{2}$; D. VI-12; A. 11; P. 20; scales in lateral series 70, in transverse series 20.

Body thickset, rather cylindrical anteriorly; caudal peduncle deep, compressed. Head broad, its dorsal contour concave in region of eyes; snout long, pointed. Eyes small, directed obliquely upward; space between eyes equal to $1\frac{1}{2}$ times their diameter. Mouth very large, oblique; lips rather broad; lower jaw projecting beyond the upper. Maxillary exposed posteriorly, extending to a vertical through posterior edge of pupil, varying in length in different individuals.

Tongue broad, notched anteriorly. Teeth minute, simple, in narrow bands on both jaws; the outer ones but little enlarged. Gill openings large but not extending extremely far forward; the width of isthmus about equal to space between eyes. No papillæ on shoulder girdle. Gill-rakers on first arch 2+8; short; rather slender. Anterior nostril with a short tube. No barbels on lower jaw.

Head naked. Body with small cycloid or finely ctenoid scales, both kinds often occurring on the sides of the same individual; scales on nape and breast minute; those on belly small and easily displaced.

Dorsals separate: the spines lower than the rays; when depressed the first dorsal does not reach insertion of second. Anal inserted below base of third or fourth dorsal ray, extending when depressed a little farther posteriorly than does the dorsal, both falling considerably short of reaching base of caudal. Pectoral rather pointed, its upper edge without free filaments. Caudal rounded. Ventrals free posteriorly.

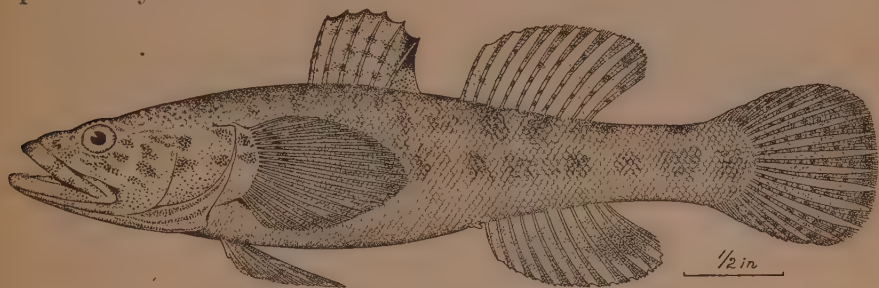


FIG. 13.—*CHENOGOBIUS MACROGNATHOS*.

Sides mottled with brownish or dusky; a lateral row of about 9 indistinct large blotches present, the most posterior at base of caudal fin; head with mottlings and reticulations of dark color. Spinous dorsal with a dark blotch on its posterior upper part; fin with a very narrow dark edge, below which is a light band anteriorly; other parts of fin dusky; soft dorsal dusky, with small white spots; caudal with dark broad zigzag vertical bands; anal dusky; the soft dorsal, caudal, and anal conspicuously bordered with white; pectorals light; ventrals dusky.

Here described from a specimen collected near Tokyo by Professor Otaki.

The species is of wide distribution, living in rivers, and is but little less abundant than *Chenogobius similis*. It is subject to considerable variation in shape of body, length of maxillary, and in color. Some specimens from Lake Biwa have the caudal peduncle narrower than have those from other localities. The length of the maxillary varies considerably with the sex, in the females being much shorter than in the males. Some are very light in color, but the pattern as described is

usually preserved. The darker ones may have either light or dark ventrals and anal, these fins in some cases being almost black.

Our specimens are from Funaki, Omi; Kurume; Aomori; Tokyo; Tsuruga; Chitose; Matsubara; Same; Gifu, Mino; Nagoya; Owari; Kawatana.

(μακρός, long; γνάθος, jaw.)

Measurements of Chanogobius macrognathos.

	Matsubara. Lake Biwa.		Fukabe River, Gifu, Mino.		Bay of Tokyo.	
Length in millimeters	87	77	72	65	89	82
Depth expressed in hundredths of length	24	21½	20	18	21½	21
Depth of caudal peduncle	11	11	12	12	10	12
Length of head	31	30	30	31½	30	30
Length of snout	10	9	9	9	10	10
Length of maxillary	13½	12½	13½	15½	15	15½
Width of interorbital space	5	5	5	5	5½	5
Diameter of orbit	5½	6½	6	6	5	5
Distance from snout to spinous dorsal	42½	41½	42	42	41	42½
Distance from snout to soft dorsal	63	62	62	62	62	62
Height of longest dorsal spines	13½	14	14	13	13	11½
Height of longest dorsal rays	14½	16	15½	15	15	14
Distance from snout to anal fin	67½	65	66	65	65	67
Height of longest anal rays	13	13	13½	14	13	12½
Length of caudal peduncle	20	22	19	20	21	21
Length of caudal fin	21½	21½	22	25	21	22
Length of pectoral fin	24	22	23	24	22	23
Length of ventral fin	18	17	18	19	17	18
Number of dorsal spines	6	6	6	6	6	6
Number of dorsal rays	11	11	12	11	11	12
Number of anal rays	11	11	11	12	11	11
Number of pectoral rays	18	18	18	18	18	19
Number of scales in lateral series	65	65	68	67	74	68
Number of scales in transverse series	22	22	21	21	22	22

	Fukabi, Gifu.				Matsubara, Lake Biwa.			
Length of body in millimeters	71½	73	71½	64	70	48	42½	42
Depth of caudal peduncle expressed in hundredths of length	12	11	12	12	11	11	11	11
Length of snout	10	9½	9½	10	10	8	10	9
Length of maxillary <i>a</i>	20	16	18	17½	17½	13	12	10
	Male.	Female.	Male.	Male.	Male.	?	Female.	Female.

a Measured from tip of snout to posterior end of maxillary.

	Lake Biwa.				Nagoya.			
Length of body	49	51	54	50	73	75	60	.....
Depth of caudal peduncle	8	8½	8	8½	10	12	10	.....
Length of snout	9½	9½	10	9	9½	8	10	.....
Length of maxillary	20	20	19	17	15½	14	18	.....
	Male.	Male.	Male.	Male.	Female.	Female.	Male.	.....

13. CHLOEA Jordan and Snyder.

Chloea JORDAN and SNYDER, new genus (*castanea*).

This genus is very close to *Chanogobius*, differing chiefly in the presence of 7 or 8 dorsal spines instead of 6. The isthmus is a little wider than in *Chanogobius*, and the head a little less depressed above. Salient characters of the two genera are the large oblique mouth,

prominent chin, notched tongue, moderate or short soft dorsal and anal, naked head, and the very small scales. No silky rays to the pectorals.

The species are small and speckled in coloration, abounding on the sandy shores of Japan, especially to the northward.

Named for Mrs. Chloe Lesley Starks, artist and naturalist.

- a. Head large, $2\frac{3}{8}$ in length, rather pointed and not 4-angled in section; depth $4\frac{3}{4}$ in length; scales 67-19; dorsal rays VII-11; body and fins finely mottled or dotted *castanea*. 27
- aa. Head shorter, $3\frac{1}{2}$ to $3\frac{3}{4}$ in length, somewhat 4-angled in section; depth about 6 in length.
- b. Dorsal rays VII-11; scales 72-20 *lævis*. 28
- bb. Dorsal rays VII-13.
- c. Scales 90-26 *mororana*. 29
- cc. Scales 70-20 *sarchymnis*. 30

27. CHLOEA CASTANEA (O'Shaughnessy).

Gobio castaneus O'SHAUGHNESSY, Ann. Mag. Nat. Hist., XV, 1875, p. 145, Nagasaki.

Head $2\frac{3}{8}$ in length; depth $4\frac{3}{4}$; depth of caudal peduncle $2\frac{1}{2}$ in head; diameter of eye 4; length of maxillary $2\frac{1}{2}$; D. VII-11; A. 11; P. 18; scales in lateral series 67, in transverse series 19.

Body robust, almost cylindrical; caudal peduncle narrow, somewhat compressed. Head rather pointed, deeper than wide. Eye of medium size, directed almost laterally, the upper edge projecting slightly above the dorsal outline of head; width of space between eyes equal to about half their diameter. Mouth oblique, lower jaw projecting somewhat beyond the upper. Maxillary exposed at its posterior end only, reaching a vertical between anterior edge of orbit and pupil. Teeth villiform, in narrow bands on both jaws, the outer ones of lower jaw slightly enlarged. Tongue notched anteriorly. Gill opening not extending far forward; the isthmus wide. Gill-rakers on first arch 2 + 11; rather thick set. Pseudobranchiæ large. No papillæ on shoulder girdle.

Head naked except on occiput, where there are minute scales. Body covered with small, finely ctenoid scales, except on breast, which is naked; scales on median line of belly easily displaced.

Dorsal fins separate, the spines almost as high as the rays. Anal inserted below base of second or third dorsal rays; the rays equal in height to the dorsal spines, the depressed fin reaching a little farther posteriorly than does the dorsal, both falling considerably short of base of caudal. Caudal round; pectoral without filaments on upper edge; round posteriorly. Ventrals rather short and broad.

Color in spirits yellowish, tinged with olive; upper parts having narrow dusky bands with a reticulate arrangement. Dorsal fins with small dusky spots on spines and rays in diagonal rows. Caudal with faint dusky spots. Other fins with a little dusky.

Described from a specimen taken at Tsuruga, Echizen. Other specimens are from Nagasaki, Misaki, Matsushima, Aomori, Tsuruga, Niigata. The species is common in sandy bays.

(*Castaneus*, chestnut).

Measurements of *Chloea castanea*.

	Tsuruga, Echizen.					Nagasaki, Hizen.			
	56	56	55	51	56	46	44	40	40
Length in millimeters.....	56	56	55	51	56	46	44	40	40
Depth expressed in hundredths of length.....	22	20	21	21	19	19	19	17	21
Depth of caudal peduncle.....	10	8 $\frac{1}{2}$	9	9 $\frac{1}{2}$	9	10	10	9	10
Length of head.....	27	26 $\frac{1}{2}$	27	28	25	27	29	28	29
Length of snout.....	7	7	8	8	8	7 $\frac{1}{2}$	8	7 $\frac{1}{2}$	8
Length of maxillary.....	11 $\frac{1}{2}$	10	11	12	10	10	12	10	10 $\frac{1}{2}$
Width of interorbital space.....	2	2 $\frac{1}{2}$	3	3	3	3 $\frac{1}{2}$	3 $\frac{1}{2}$	3	3
Diameter of orbit.....	7	6	6	7	6	6	8	7	7
Distance from snout to spinous dorsal.....	38	37	37	38	36	38	37 $\frac{1}{2}$	38	38
Distance from snout to soft dorsal.....	58	58	57	56	56	57	58	57	56
Height of longest dorsal spines.....	13	13	14	14	10	12	13	13	15
Height of longest dorsal rays.....	14	15	15	15	13	14	12 $\frac{1}{2}$	16	15
Distance from snout to anal fin.....	63	61	64	61	63	61	62	60	59
Height of longest anal rays.....	13	13	14	13	12	11 $\frac{1}{2}$	12	13	13
Length of caudal peduncle.....	22	24	24	23	23	24	23 $\frac{1}{2}$	23	25
Length of caudal fin.....	21	22	22	23	20	19	18	20	21 $\frac{1}{2}$
Length of pectoral fin.....	21	20	19	23	20	18	21	20	19
Length of ventral fin.....	20	20	22	23	20	19	20	22	19
Number of dorsal spines.....	7	7	7	7	7	7	7	7	6
Number of dorsal rays.....	11	11	11	11	11	11	11	11	11
Number of anal rays.....	11	11	10	11	11	11	11	10	10
Number of pectoral rays.....	18	17	17	18	18	18	19	18	19
Number of scales in lateral series.....	67	70	68	65	69	63	63	64	65
Number of scales in transverse series.....	19	20	19	20	19	18	18	18	18

28. *CHLOEA LÆVIS* Steindachner.

Gobius levis STEINDACHNER, Ichth. Beitr. VIII, 1879, p. 20, Hakodate.

Head $3\frac{1}{2}$; depth 6; D. VII-1, 11; A. I, 11; P. 21. Eye 6 in head; snout $3\frac{3}{8}$; scales 70 to 75-20.

Body compressed. Head four-angled in section, flat above; a streak of scales on middle of nape; sides of head naked. Mouth large, rising vertically; end of maxillary a little behind middle of eye. Teeth numerous, small; no canines; tongue emarginate. Scales cycloid; small. First dorsal weakly convex, the fifth spine longest; second dorsal scarcely higher; pectoral long, about as long as caudal without silky rays. Clear brown, with many dark specks. A dusky spot at base of caudal; fins all translucent, with thick-sown points, especially the ventrals which are dusky in the males. Second dorsal and caudal with regular cross-bands; tip of first dorsal dusky. Length 80 mm. (Steindachner.)

Hakodate, not seen by us.

(*Lævis*, smooth.)

29. *CHLOEA MORORANA* Jordan and Snyder, new species.

Head $3\frac{3}{4}$ in length; depth $6\frac{1}{4}$; depth of caudal peduncle $3\frac{1}{2}$ in head; eye $5\frac{1}{2}$; snout $3\frac{1}{2}$; maxillary $1\frac{1}{2}$; D. VII-13; A. 12; P. 20; scales in lateral series 90, in transverse series 26.

Body moderately compressed, sloping considerably from the deepest part to caudal peduncle. Head as wide as body but much less deep, rather long, pointed. Eyes placed high, the upper margin projecting slightly above head, directed laterally; interorbital area flat; distance between eyes about equal to their diameter. Mouth extremely large; oblique, the cleft curving upward in front. Maxillary notably long extending beyond eye a distance equal to the eye's diameter. Lower jaw projecting beyond the upper. Teeth villiform, in narrow bands on both jaws, the outer ones slightly enlarged; no canines. Tongue deeply notched. Gill opening extending forward a short distance; width of isthmus equal to diameter of eye. Inner edge of shoulder girdle without papillæ. Gill-rakers very long and slender, $5 + 19$ on first arch. Anterior nostril with a tube. No barbels on head.

Head naked; body with very small cycloid scales; nape with a naked space running from insertion of dorsal to occiput, the scales extending forward along the sides; breast and median part of belly naked.

Dorsals separate, the spines slender, when depressed not reaching insertion of soft dorsal; soft dorsal somewhat higher anteriorly, when

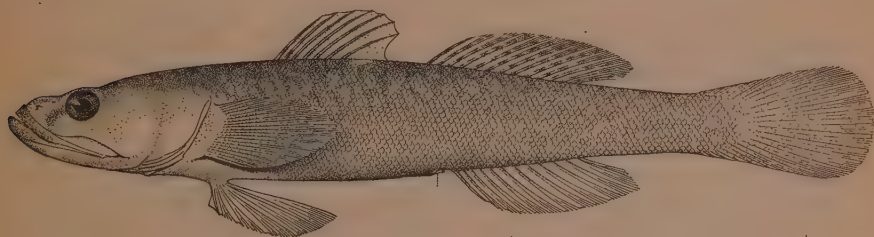


FIG. 14.—*CHLOEA MORORANA*.

depressed, the rays fall far short of reaching the caudal. Anal inserted below base of third or fourth dorsal ray, extending a little farther posteriorly than does the dorsal. Caudal bluntly rounded. Pectoral acutely rounded; the upper edge without free filaments. Ventrals large, almost as long or longer than pectorals, free posteriorly.

Color in spirits light yellowish olive, finely dotted with black; the dots gathered in clouds and reticulations on the upper parts; snout and lower jaw rather darker than other parts of head. Spinous dorsal dusky at base, growing lighter toward the margin; soft dorsal with dusky spots arranged in oblique rows; caudal dusky, with very indistinct spots in transverse rows. Pectorals and anal with a little dusky.

The species is represented by several specimens from Mororan, Hokkaido. The type is No. 6452, Leland Stanford Junior University Museum. Locality, Mororan, Hokkaido. We also have two examples from Tokyo which are slightly darker in color; the spinous dorsal has a blackish blotch on its posterior part. The species is not rare

about rocks and in rock pools to the northward. Our specimens are from Mororan, Tokyo, and Matsushima Bay.

(*Mororan*, iris-huts; a town on Volcano Bay where the species was first taken.)

Measurements of Chloea mororana.

Length in millimeters.....	70	62	59
Depth expressed in hundredths of length.....	19	16	18
Depth of caudal peduncle.....	8	8	9
Length of head.....	26½	27	27
Length of snout.....	8	8	8
Width of interorbital space.....	3½	3	3
Diameter of orbit.....	5	5½	5
Distance from snout to spinous dorsal.....	36	36½	37
Distance from snout to soft dorsal.....	55	57	57
Height of longest dorsal spines.....	12½	11	11
Height of longest dorsal rays.....	12	12	11
Distance from snout to anal fin.....	61	59	61
Height of longest anal rays.....	11½	11	12
Length of caudal peduncle.....	21	21	20
Length of caudal fin.....	20	20	20
Length of pectoral fin.....	18	18	18
Length of ventral fin.....	19	17	16
Number of dorsal spines.....	9	7	7
Number of dorsal rays.....	14	13	14
Number of anal rays.....	14	13	14
Number of scales in lateral series.....	90	91	95
Number of scales in transverse series.....	26	27	26
Locality, Mororan.			

Number of dorsal spines.....	7	7	8	7	8	8	8
Number of dorsal rays.....	14	14	14	13	13	13	14
Number of anal rays.....	14	14	14	12	13	13	14

30. *CHLOEA SARCHYNNIS* Jordan and Snyder, new species.

Head $3\frac{3}{8}$ in length; depth $5\frac{1}{2}$; depth of caudal peduncle 3 in head; eye 4; snout $3\frac{3}{8}$; maxillary $1\frac{1}{2}$; D. VII-13; A. 13; P. 20; scales in lateral series 70, in transverse series 20.

Body rather elongate, somewhat compressed. Head long, sharp. Eyes directed laterally, the space between them about equal to their diameter. Snout a little longer than eye. Mouth large, oblique; lower jaw projecting beyond the upper. Maxillary very long, extending beyond posterior border of eye and considerably farther than cleft of mouth, its posterior third being free. Teeth simple, very small, slender; in narrow bands on both jaws. Tongue very deeply cleft. Vomer with 2 conspicuous pads projecting downward, each apposed to a lobe of the tongue. Gill openings extending moderately far forward; the width of isthmus about equal to length of snout. No papillae on inner edge of shoulder girdle. Gill-rakers on first arch 6 + 14, long and very slender. Head without barbels.

Head naked; body covered with small, finely ctenoid scales, except on breast and nape; the naked space on nape not quite reaching insertion of spinous dorsal.

Dorsals widely separated, the spines short and slender, the rays a little longer than spines; when depressed the fin falls far short of reaching caudal. Anal inserted below base of second dorsal ray; when

depressed it extends slightly farther backward than does the dorsal. Caudal obtusely rounded or truncate behind. Pectorals pointed; the upper edge without filamentous appendages. Ventrals free posteriorly.

Sides with a row of 15 or more small dusky spots, some of which are joined together; upper parts with dusky reticulations; a band extending forward from eye; snout dusky. Spinous dorsal with a small dark spot on its posterior part; soft dorsal with small dusky spots arranged in 2 horizontal rows; anal with just a trace of dark color; lower half of caudal dusky; pectorals and ventrals without dark color.

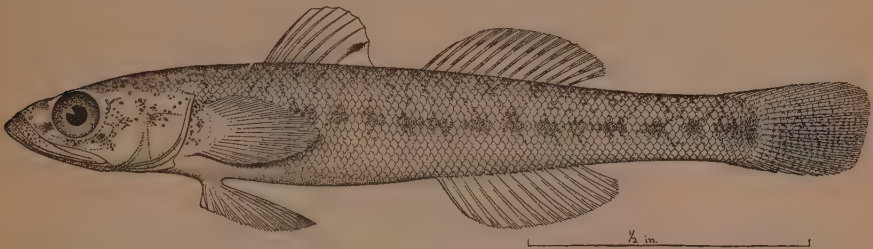


FIG. 15.—*CHLOEA SARCHYNNIS*.

Type No. 6463, Leland Stanford Junior University Museum. Locality, Wakanoura. We have 7 small specimens only, all from the type locality.

The species closely resembles *Chloea mororana*. It has larger scales and is differently colored. The latter species has not the vomerine pads described above, although some specimens show elevations on each side of the vomer.

(σάρξ, flesh; ὄνυς, vomer.)

Measurements of Chloea sarchynnus.

Length expressed in millimeters.....	83	32	31
Depth expressed in hundredths of length.....	17	17	16
Depth of caudal peduncle.....	9	9	8
Length of head.....	28	26	26
Length of snout.....	8	7	7
Length of maxillary.....	15	15	16
Width of interorbital space.....	4	4	4
Diameter of orbit.....	6	7	7
Distance from snout to spinous dorsal.....	35	35	35
Distance from snout to soft dorsal.....	57	56	56
Height of longest dorsal spines.....	12	10	12
Height of longest dorsal rays.....	12	12	14
Distance from snout to anal fin.....	57	55	57
Height of longest anal rays.....	12	7	12
Length of caudal peduncle.....	21	22	23
Length of caudal fin.....	19	18	20
Length of pectoral fin.....	19	18	16
Length of ventral fin.....	16	15	15
Number of dorsal spines.....	7	7	7
Number of dorsal rays.....	13	13	13
Number of anal rays.....	13	13	13
Number of scales in lateral series.....	70	64	70
Number of scales in transverse series.....	20	20	20

16. CHASMIAS Jordan and Snyder.

Chasmias JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 761 (*misakius*).

Body moderately elongate, covered with very small, cycloid scales; head broad, flattish above, wide between the eyes, the cheeks without scales; mouth very large, horizontal, the lower jaw included; teeth in moderate bands; maxillary much produced backward; tongue broad, rounded; isthmus very broad, the gill openings restricted to the sides. Shoulder girdle without fleshy flaps; no barbels. Dorsal fins short, the first of 6 low, flexible spines; caudal rounded; pectorals with free silky tips above; no filamentous rays on dorsal; ventrals short and broad.

This genus is near to *Platygobius* Bleeker (*macrorhynchus*), differing at least in the small, smooth scales and in the narrow gill openings.

(*χασμάω*, to yawn, from the large mouth.)

- a. Vertical fins distinctly spotted or checkered with black; scales moderate, about 60-20; depth 6 in length; a black caudal spot *dolichognathus*. 31.
- aa. Vertical fins dusky, nearly plain or dotted with white, and with a broad whitish margin; scales minute, about 90-30; depth $4\frac{2}{3}$ in length; a black caudal spot *misakius*. 32.

31. CHASMIAS DOLICHOGNATHUS (Hilgendorf).

Gobius dolichognathus HILGENDORF, Sitzber. Naturf. Freunde, 1878, p. 108, Tokyo; Mus. Berl., Nos. 1065, 10654.

Head $3\frac{2}{3}$ in length; depth 6; depth of caudal peduncle $2\frac{2}{3}$ in head; eye $5\frac{1}{2}$; snout 3; maxillary $1\frac{3}{4}$; D. VI-11; A. 10; P. 20; scales in lateral series 58, in transverse series 19.

Body about like that of *C. misakius*; the head somewhat smaller, the space between the eyes narrower, and the snout shorter and more rounded. Eyes small; not directed upward; interorbital space wide, the distance between the eyes a little less than length of snout. Mouth nearly horizontal, very large; the maxillary extending to a vertical through a point posterior to the hinder margin of the eye, a distance equal to one-half the diameter of eye. Lower jaw included by the upper. Lips rather thick and pendulous. A fleshy flap before and below the eye hanging down over the lip. Teeth in narrow bands near middle of jaws, the posterior half of each side of jaw being naked; teeth villiform; those of upper jaw with a somewhat enlarged outer series; pharyngeal teeth above and below stiff, bristle-like. Gill openings extending but little forward of the base of pectorals, the isthmus wide. Gill-rakers on first arch 3 + 8, minute, slender. No papillæ on inner edge of shoulder girdle.

Head naked; skin but little wrinkled or folded; pores on head similar to those of *C. misakius*. Anterior nostrils with tubes. Scales

on body small and weak, cycloid. A suggestion of a lateral line similar to that of *C. misakius* is present.

Fins like those of *C. misakius*; the upper edge of pectoral with thread-like appendages.

Sides with distinct, elongate, light color patches which extend upward and downward from a horizontal somewhat above the median part of body; of those below, the first spot is immediately behind the base of pectoral; above this a very indistinct light band passes over the body behind the occiput; the second has a fellow above, which unites with one on the opposite side at insertion of spinous dorsal; the third has 2 bands above it, the posterior of which passes over the body at insertion of soft dorsal; others with corresponding spots above, the last 2 uniting to form 1 band. Sides also with scattered small

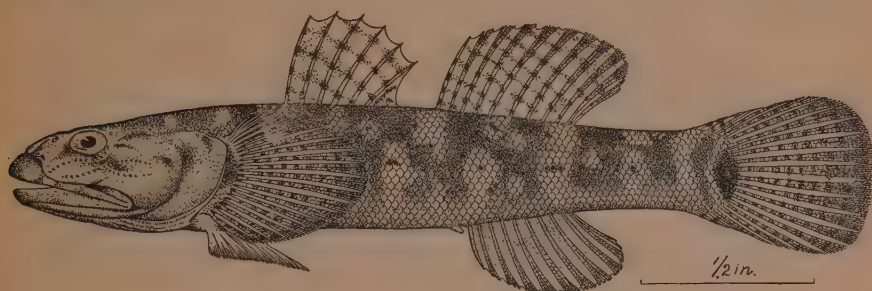


FIG. 16.—CHASMIAS DOLICHOGNATHUS.

light spots, and with black dots, some of which are on the light areas. A large black spot at base of caudal. Head above with indistinct dark dots and bars, the latter extending backward from the eye; ventral parts of head with minute spots of dead white. Pectorals, dorsal and caudal fins with small dark spots arranged in lines, transversely on pectoral and caudal, longitudinally on spinous dorsal, and obliquely on soft dorsal. Anal dusky. Ventrals without dark color.

Described from a specimen collected at Misaki. The species is very abundant along the beaches and among the rocks between tide marks from Hakodate to Nagasaki, being in many places the most abundant species. It was taken by us at Misaki, Wakanoura, Nagasaki, Tsuruga, Matsushima, Enoshima, Hakodate, and Same.

(δολιχός, long; γνάθος, jaw.)

Measurements of *Chasmias dolichognathus*.

Length in millimeters	53	46	51	58	46	48	43	36	36	36
Depth expressed in hundredths of length	16	17½	18	19	22	19	17	19	18	18
Depth of caudal peduncle	10	11	11½	11	11	12	10	13	11½	12
Length of head	29	31	30	29	30	30	31	32	31	31
Length of snout	9½	10	10	10	11½	9	10	10	10	10
Width of interorbital space	3	4	4	3½	3½	4	4	3½	4	4
Diameter of orbit	5	6½	5	5	6	6	6½	7	9	7
Distance from snout to spinous dorsal	40	41	41	41	43	42	42	42	42½	41
Distance from snout to soft dorsal	60	59	60	60	60	60	60	60	60	61
Height of longest dorsal spines	13½	13½	11	12	14	14	14	13	13	14
Height of longest dorsal rays	14	15	13	14	17	14	15½	16	14	15
Distance from snout to anal fin	63	62	64	64	62	65	63	62	60	59
Height of longest anal rays	11½	13	13	12	14	13	14	15	14½	14
Length of caudal peduncle	22	22	21	24	24	21	24	25	24½	25
Length of caudal fin	22	23	22	21	24	22	25	24	22	23
Length of pectoral fin	19	22	21	20	22	22	23	22	21	22
Length of ventral fin	12½	12	12½	11	12	10	12	14	13	14
Number of dorsal spines	6	6	6	6	6	6	7	6	6	6
Number of dorsal rays	11	11	11	11	11	11	10	11	11	11
Number of anal rays	10	10	10	10	9	10	10	10	10	10
Number of pectoral rays	20	20	20	19	20	20	20	19	20	21
Number of scales in lateral series	58	68	56	59	62	59	65	60	56	56
Number of scales in transverse series	19	19	18	17	18	18	17	19	17	17

32. CHASMIAS MISAKIUS Jordan and Snyder.

Chasmias misakius JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 761, pl. xxxvi, Misaki, Tsushima, Nagasaki.

Head $3\frac{1}{5}$ in body; depth $4\frac{2}{3}$; depth of caudal peduncle $2\frac{1}{2}$ in head; length of snout $2\frac{2}{5}$; maxillary $1\frac{2}{5}$; D. VI-11; A. 10; P. 21; scales in lateral series 89, in transverse series 28.

Body thickset, the caudal peduncle deep; head very broad, depressed, wider posteriorly than the body; snout, viewed from above, broadly rounded. Eyes small, directed obliquely; interorbital space markedly wide, the distance between the eyes equal to the length of the snout. Mouth extremely large, horizontal; lower jaw included by the upper, the wide upper lips hanging down over the lower; upper lip with a fringed interior border next the teeth. Maxillary extending posteriorly to a vertical through a point midway between eye and edge of opercular flap; covered for the greater part of the length. Tongue very broad, slightly notched. Teeth villiform, none of them enlarged, in bands which extend backward a little less than half the length of mouth; pharyngeal teeth bristle-like. Gill opening not large; the lower edge an eye's diameter below base of pectoral; the width of isthmus slightly greater than depth of caudal peduncle. Gill-rakers on first arch $3 + 10$, short and slender, the length of longest less than diameter of pupil. No protuberances on inner edge of shoulder girdle. Lower jaw without barbels. Anterior nostril with a conspicuous short tube, widened at its opening.

Head naked; the skin thick, not much wrinkled nor folded; preorbital with a fleshy flap which extends forward and downward below nostrils. A conspicuous line of pores extends from a point above and posterior to the nostrils forward and then downward along upper edge of preorbital flap, where it divides, one branch running backward below the eye and curving upward behind it, the other backward toward the

middle of cheek. A similar line of pores lies on either side of lower jaw, between the folds of skin. A large pore on interorbital space between posterior parts of eyes. Body with small, thin, cycloid scales, which are more or less deeply embedded in the skin. Anteriorly the scales are closely crowded and somewhat irregularly placed; on the breast and belly they are minute and almost hidden beneath the skin.

Dorsal fins well separated; height of longest spines about equal to length of snout; posterior spine connected with the back by a large triangular membrane; rays somewhat higher than the spines, the longest about equal to depth of caudal peduncle; no membrane connecting posterior ray with the back. Anal equal in height to spinous dorsal; when depressed the anal and dorsal extend an equal distance posteriorly, both falling short of bases of first caudal rays a distance equal to one-half the depth of caudal peduncle. Caudal rounded. Pectoral rounded; its upper edge with a fringe of 14 or 15 thread-like filaments, of which each ray except the uppermost contributes 2. Ventrals short, free from body posteriorly; the membrane connecting the spines fleshy, elevated; its height equal to diameter of eye, its edge concave.

Color in spirits dark above, the throat and belly light; head with indistinct dots above, and scarcely discernible bars on cheeks; sides of body with irregularly shaped small white spots, in which a transverse arrangement is suggested. Dorsal, anal, and caudal fins edged with white, the white of caudal forming a distinct band; membranes of fins with indefinite light spots; first dorsal with a large, round, white spot just behind last spine, where the membrane is black; caudal with a large black blotch at its base, followed by a transverse row of small white spots, 1 on each ray. Pectorals and ventrals without spots except at the base of the former.

Length of the type 100 mm.

Smaller specimens have the spots on top of head and the bars or spots on cheeks distinct; anterior parts of body with small dark spots; sides with 8 or 9 transverse, light-colored bands with small light blotches between them, in some cases the bands being broken up into elongate blotches. The dark caudal spot and the white terminal band are very distinct.

On the smaller specimens a lateral line is suggested by a row of 29 groups of minute papillae extending along the middle of the sides. Each group has 5 or 6 papillae in 1, or occasionally 2, vertical rows, which are a little less than the width of a scale in length. A mere trace of the lateral line is seen on large specimens.

A specimen from Tsushima appears to have no light spots on the sides. The dark spot at base of caudal is scarcely perceptible.

Type No. 6484, Leland Stanford Junior University Museum.

This species very closely resembles *P. dolichognathus*. It differs from it in coloration, not having very distinct, narrow, wavy, dark

bands on pectorals, dorsals, and caudal; in having a terminal band of white on the caudal, a sharper snout, and much smaller scales.

It is very abundant about the rocky headlands of Japan, especially about Misaki. Our specimens are from Misaki, Nagasaki, Enoshima, Tsushima, and Hakodate.

(*Mi*, red; *saki*, point; name of a very fine collecting ground on which the investigation station of the Imperial University of Tokyo is situated.)

17. PTEROGOBIOUS Gill.

Pterogobius GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 266 (*virgo*).

Body moderately elongate, somewhat compressed, covered with very small cycloid or finely ctenoid scales; head not depressed, rounded in profile, broad between the eyes, the cheeks with a patch of small scales above or wholly naked; mouth moderate, terminal, oblique, the lower jaw more or less prominent; tongue rounded, scarcely or not at all notched at tip; teeth moderate, the outer enlarged; gill openings moderate, separated by a rather broad isthmus. No barbels. First dorsal of about 8 slender spines, sometimes produced in the male; soft dorsal and anal very long, of 20 to 30 very slender, close-set rays; caudal fin moderate; pectoral fin of slender rays, the upper silk-like, with free tips. Ventrals well developed, not adnate to the belly.

Gobies of rather large size and striking coloration, the most brilliant members of the family, found about the rocks in clear water on the shores of Japan and Korea.

(*πτερόν*, fin; *Gobius*, from the long fins.)

- a. Body without vertical bands; its color stripes of orange and dark blue running horizontally; fins washed with orange and dark blue; D. VIII-28; A. 27; scales 133. *virgo*. 33
- aa. Body with vertical bands, light or dark, and no horizontal stripes.
- b. Body with black cross-bands on a background of clear brown.
- c. Eye with a dark cross-band; bands on body sharply defined and edged with paler. Dorsal rays VIII-22; scales 78.
- d. Caudal fin with a black cross-band at its base; dark rings on body bordered with yellow *elapoides*. 34.
- dd. Caudal fin without dark cross-band at base; dark rings on body edged with pale *daimio*. 35.
- cc. Eye without dark cross-band; bands on body broad, diffuse, not edged with pale. Dorsal VIII-26; scales 96 *zacalles*. 36.
- bb. Body with very faint, pale cross-bands on a ground color of light olive. Dorsal VIII-20; scales 66 *zonoleucus*. 37.

33. PTEROGOBIOUS VIRGO (Schlegel).

Gobius virgo SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 143, pl. LXXIV, fig. 4, Nagasaki.—GÜNTHER, Cat. Fish., III, 1861, p. 79; after Schlegel.

Head 4 in length; depth $6\frac{1}{2}$; depth of caudal peduncle 10; eye 6 in head; snout $2\frac{5}{8}$; maxillary $2\frac{5}{8}$; D. VIII-28; A. 27; P. 22; scales in lateral series 133, in transverse series 41.

Shape of head and body similar to that of *P. daimio*. Eyes of moderate size, directed laterally; interorbital space concave, the distance between the eyes equal to $1\frac{1}{2}$ times their longitudinal diameter. Maxillary concealed, extending to a vertical between anterior edge of orbit and pupil; mouth oblique. Teeth simple, slightly curved, in 2 or 3 rows on each jaw, the outer row slightly enlarged; no canines. Tongue broad, its edge slightly concave. Gill-rakers on first arch $4 + 10$, slender, about equal in length to diameter of pupil. No papillæ on inner edge of shoulder girdle. No barbels on chin. Nostrils without tubes or evident rims.

Head with minute scales on occiput and on upper part of opercle and preopercle, those on occiput not extending forward to edge of orbit. Other parts of head naked. Body covered with small, finely ctenoid scales; those on under parts and on upper posterior region cycloid.

Dorsals separate. Spinous dorsal, when depressed, reaching a short distance beyond insertion of soft dorsal. Anal inserted below third or fourth dorsal ray, extending posteriorly an equal distance with the dorsal, both fins reaching base of caudal. Caudal rounded. Pectoral with a few short filaments on upper border. Ventrals rather long, free posteriorly.

Color in alcohol light olive; 2 narrow, parallel, dark, lateral bars, the lower of which is on median part of body, extending from tip of snout to caudal; a third line on cheeks parallel to the others. Fins dusky, the dorsals bordered with white, below which is a dark band; margins of anal and caudal broadly suffused with black; pectorals and ventrals dusky.

Color in life light grayish olive, somewhat greenish on the back; a lateral band of bright orange bordered above and below by sky blue, the lower border tinged with violet ventrally; sides of head orange, the blue bands of body extending in wavy or broken lines, growing brighter in color, to end of snout; a violet-blue band on cheeks extending backward from mouth; a blue spot above each eye; forehead and lips dusky; under part of head tinged with violet. Dorsal fins olive, bordered below with orange, above with a narrow band of sky blue; the dorsal edges of fins orange; a blackish blotch on anterior part of spinous dorsal; caudal olive, broadly margined with violet, the edges black; bands of body extending on basal third of fin; anal with a broad violet band and a dark margin. Pectoral and ventral olive gray, slightly shaded with dusky.

The specimens of which this description was written were collected in the inland sea of Japan, at Miyajima, in the province of Aki. Other specimens were taken at Uruga. The species reaches the length of 150 to 200 millimeters. It is taken rather rarely in clear water about rocks in the sea, and is one of the most brilliantly colored of Japanese fishes. It is known as *Berahaze* or Labroid goby.

It may be known from the other species of the genus by the absence of vertical color bands on the body, its bright stripes running horizontally.

(*Virgo*, a virgin, in allusion to the gay coloration.)

Measurements of Pterogobius virgo.

Length in millimeters	166	158	144
Depth expressed in hundredths of length	16	15½	17
Depth of caudal peduncle	10	10	10
Length of head	25	24	24
Length of snout	9	8½	9½
Width of interorbital space	5	5	5
Diameter of orbit	4½	4½	5
Distance from snout to spinous dorsal	31	30	30
Distance from snout to soft dorsal	51	51	52
Height of longest dorsal spines	11	11	11
Height of longest dorsal rays	9½	10	10
Distance from snout to anal fin	56	56	55
Height of longest anal rays	9½	10	10
Length of caudal peduncle	11½	11½	11
Length of caudal fin	20	21	21
Length of pectoral fin	20	20	21
Length of ventral fin	15	14	14
Number of dorsal spines	8	8	8
Number of dorsal rays	28	26	27
Number of anal rays	27	27	27
Number of pectoral rays	22	22	23
Number of scales in lateral series	133	130	136
Number of scales in transverse series	41	40	39

34. *PTEROGOBIOUS ELAPOIDES* (Günther).

Gobius elapoides GÜNTHER, Proc. Zool. Soc. London, 1871, p. 665, pl. LXIII, fig.

D. Locality unknown, supposed to be from Japan. Coll. A. Adams.

Pterogobius elapoides is very closely related to *P. daimio*. We have been able to find no striking difference between the two except in color. The former is lighter, the ground shades pinkish-brown and the dark cross-bands dark brown instead of deep brownish black, as in the latter. The bands are narrower in *P. elapoides*, and there is, in addition to those on the body, alike in the two species, a distinct vertical band on base of caudal. This band on the caudal serves to distinguish the species at a glance.

In life the dark rings of the body are bordered by narrow bands of bright lemon yellow. The dorsal and caudal fins are dull, brick red.

The range of the species is evidently farther to the northward than that of *Pterogobius daimio*, both species living in clear water about rocks in the open sea.

In the original description by Dr. Günther the habitat of this species was doubtfully assigned to the seas of Japan. We obtained many specimens at Aomori, at Hakodate, from Matsushima Bay, and from Utatsu in Noto. P. L. Jouy collected numerous individuals at Fusan, Korea.

(*Elaps*, the coral snake; εἶδος, likeness, from the resemblance of the cross-bands.)

Measurements of Pterogobius elapoides.

	Hakodate, Hokkaido.		Fusan, Korea.		
Length in millimeters.....	78	62	73	62	68
Depth expressed in hundredths of length.....	22	22	21	20	22
Depth of caudal peduncle.....	12	11	12	12	12
Length of head.....	26	26	27	26	27
Length of snout.....	9	9	9	8	8
Width of interorbital space.....	5	5	5½	6	6
Diameter of orbit.....	5½	6	5	6	6
Distance from snout to spinous dorsal.....	35	36	34	35	34
Distance from snout to soft dorsal.....	52	52	52	53	53
Height of longest dorsal spines.....	21	18	19	23	21
Height of longest dorsal rays.....	13	11	14	14	13
Distance from snout to anal fin.....	58	58	57	58	57
Height of longest anal rays.....	12	12	12½	15	13
Length of caudal peduncle.....	17	18	15	17	17
Length of caudal fin.....	21	21	23	23	22
Length of pectoral fin.....	19	22	21	21	22
Length of ventral fin.....	12½	12	12½	14	14
Number of dorsal spines.....	8	8	8	8	8
Number of dorsal rays.....	21	21	21	21	20
Number of anal rays.....	20	20	21	19	20
Number of pectoral rays.....	21	20	19	19	20
Number of scales in lateral series.....	83	88	90	91	83
Number of scales in transverse series.....	27	27	31	31	32

35. PTEROGOBIOUS DAIMIO Jordan and Snyder, new species.

Head $3\frac{5}{8}$ in length; depth $4\frac{5}{8}$; depth of caudal puncle $2\frac{1}{8}$ in head; eye $4\frac{1}{8}$; snout 3; maxillary $2\frac{3}{8}$; D. VIII-22; A. 22; P. 23; scales in lateral series 78, in transverse series 27.

Body cylindrical, compressed posteriorly, the dorsal and ventral contours sloping but little to caudal peduncle; depth and width of head equal. Snout bluntly rounded. Eyes rather large, directed laterally; the dorsal rim projecting slightly, making the interorbital space somewhat concave. Mouth oblique; jaws equal, maxillary extending to a perpendicular through anterior edge of pupil; lips thin. Teeth in 2 series, slender and sharp, the inner ones minute, in a narrow band; outer ones much stronger, those of upper row growing successively smaller from before backward, the lower ones becoming larger laterally to the fang-like ones on sides of jaw, then abruptly smaller. Gill opening not extending far forward below, the width of isthmus equal to distance between eyes. No elevations on inner edge of shoulder girdle. Gill-rakers on first arch long, very slender, and stiff. No barbels on lower jaw.

Head with a few rather deeply embedded scales on upper edge of opercle and preopercle; occiput with small scales; other parts of head naked. Body with small cycloid scales; a few ctenoid scales below tip of depressed pectoral; scales on breast immediately behind isthmus minute, similar to those on occiput.

Dorsals separate, though close together, the 4 spines after the first greatly lengthened; when depressed their tips reach nearly to the middle of base of dorsal; the last 2 much shorter, just reaching insertion of soft dorsal when depressed; rays growing successively longer posteriorly, the last or next to last being longest. Anal similar to dorsal

in shape, inserted below base of third or fourth dorsal ray. Pectoral rounded; each of the 6 upper rays with 2 long silky filaments. Ventrals short, free posteriorly.

Color in spirits dusky above, lighter underneath, the body conspicuously marked with broad, light-edged, brownish-black lateral rings; the first passing through bases of first, second, and third dorsal spines; the second passing on either side of base of last spine; the third, fourth, and fifth crossing the base of anal; the sixth on caudal peduncle some distance anterior to base of fin; a dark band extending across the interorbital space encroaching a little on the upper surface of the eye; below the eye it is continued downward to the lower edge of cheek, growing narrower and lighter toward the lower end; upper part of head with a U-shaped mark, the open part of which is forward, the ends touching the middle of posterior edges of the eyes. Bases of dorsal and anal fins with large black spots, connected with the body rings; spinous dorsal narrowly edged anteriorly with black; pectoral, ventral, and caudal fins without distinct markings.

Living individuals have the dark rings bordered by bright yellow, the dorsal and caudal fins reddish.



FIG. 17.—PTEROGOBIOUS DAIMIO.

This species is closely related to *P. clapoidea* (Günther). We have been able to find no great differences between the two forms, except in color. *P. daimio* is darker; the dark bands on body are wider than those of *P. clapoidea*, and there is no vertical band on caudal. These differences, though slight, are definite and constant in a large number of individuals examined by us.

Our collecting in Japan seems to indicate that *P. daimio* is a southern form, the Bay of Tokyo being somewhere near its northern limit. *P. clapoidea* is found farther to the north, or if extending south is not found on the shores washed by the warm southerly currents. Our specimens are from Misaki, and from Wakanoura.

Type No. 6455, Leland Stanford Junior University Museum. Locality, Misaki, Sagami, Japan.

Described from a male specimen 105 mm. in length.

(*Daimio*, a feudal lord in Japan).

Measurements of *Pterogobius daimio*.

Length in millimeters.....	84	81	81	88	84
Depth expressed in hundredths of length.....	20	25	20	20	20
Depth of caudal peduncle.....	12½	13	14	12½	12½
Length of head.....	26	28	28	28	26½
Length of snout.....	9	10	10	10	9
Width of interorbital space.....	6½	6½	7	6½	6
Diameter of orbit.....	6	6	6	6	6
Distance from snout to spinous dorsal.....	34	35	37	34	34
Distance from snout to soft dorsal.....	52	55	54	55	53
Height of longest dorsal spines.....	39	30	32	23	32½
Height of longest dorsal rays.....	21	11	20	13	17
Distance from snout to anal fin.....	59	58	59	62	58
Height of longest anal rays.....	15	12	16½	13	15
Length of caudal peduncle.....	14½	15	16	16	15
Length of caudal fin.....	25	22½	27	22	25
Length of pectoral fin.....	21	21	23	21	21
Length of ventral fin.....	15	13	15	13	13
Number of dorsal spines.....	8	8	8	8	8
Number of dorsal rays.....	22	23	20	22	22
Number of dorsal rays.....	22	20	19	21	21
Number of dorsal rays.....	21	22	21	22	22
Number of scales in lateral series.....	77	89	78	79	80
Number of scales in transverse series.....	28	27	26	26	27

36. *PTEROGOBIOUS ZACALLES* Jordan and Snyder, new species.

Head $4\frac{1}{2}$ in length; depth $5\frac{2}{3}$; depth of caudal peduncle 10; eye $3\frac{1}{2}$ in head; snout $3\frac{1}{2}$; maxillary $2\frac{1}{2}$; D. VIII-26; A. 26; P. 22; scales in lateral series 96, in transverse series 33.

Body somewhat cylindrical, becoming more compressed near caudal fin; contours of body sloping slowly to caudal peduncle, which is little more than one-half the depth of body. Head large; not so deep or broad as body. Snout short and blunt, its length equal to diameter of eye. Interorbital space broad, concave. Eyes large; directed almost laterally. Mouth oblique; maxillary concealed by the fleshy lip; extending to a vertical passing between pupil and anterior edge of orbit. Teeth simple, in 2 series; an outer row of enlarged ones; an inner, narrow band of minute teeth; lower jaw with a small, curved canine on each side. Width of isthmus equal to length of snout. No papillæ on inner edge of shoulder girdle. Gill-rakers slender. Anterior nostril with an elevated rim or tube. Chin without barbels.

Head with minute scales on nape, upper edge of opercle, and on preopercle; those on preopercle extending downward considerably below the level of eye; other parts of head naked. Body closely covered with small, cycloid scales; a small patch of ctenoid scales in region of pectoral.

Dorsals separate, though the membrane posterior to last spine extends to insertion of soft dorsal. Fifth or sixth dorsal spine longest; the fin when depressed reaching a little beyond insertion of soft dorsal. Second dorsal very long; its base contained about $2\frac{1}{2}$ times in length. Anal inserted below base of third or fourth dorsal ray; when depressed it extends slightly beyond dorsal posteriorly, both reaching the first basal rays of caudal. Caudal acutely rounded; small upper and lower basal rays extending a short distance forward on caudal peduncle. Pectorals sharply rounded; 3 or 4 upper rays with small filaments. Ventrals free posteriorly.

Body with 5 dark, broad, vertical bands; the last on base of caudal; the first at intersection of spinous dorsal; a suggestion of a dark band on nape; color bands of body saddle-like; extending over the back, but not uniting below. Each scale with a conspicuous, narrow, dusky edging. Fins more or less dusky throughout.

This species may be distinguished at once from *P. clapoidea* and *P. daimio* by its not having a dark band passing through the eye and over the head. The bands of the body are less sharply defined and not edged with paler. It differs in color from *P. virgo* in having vertical bands on the body.

Represented by a single specimen, Type No. 6453, Leland Stanford Junior University Museum. Locality, Misaki, Sagami, Japan.

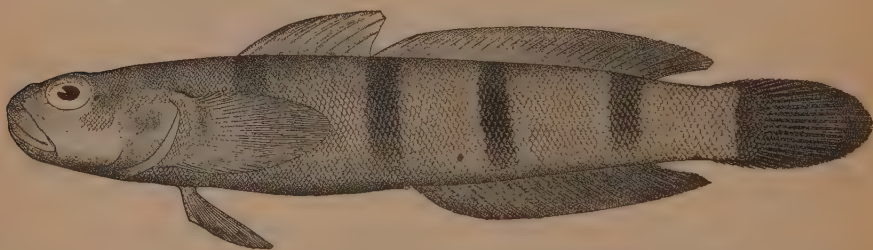


FIG. 18.—*PTEROGOBIOUS ZACALLES*.

Measurements.—Length in millimeters 91; depth, expressed in hundredths of length, 18; depth of caudal peduncle $9\frac{1}{2}$; length of snout $7\frac{1}{2}$; width of interorbital space $3\frac{1}{2}$; diameter of orbit $6\frac{1}{2}$; distance from snout to spinous dorsal 32; snout to soft dorsal 59; height of longest dorsal spines 13; rays 12; distance from snout to anal fin 58; height of longest anal rays 9; length of caudal peduncle $11\frac{1}{2}$; of caudal fin 19; of pectoral fin 20; of ventral fin 16.

A single specimen is known, 95 millimeters long, taken at Misaki, Sagami, in a rock pool on the island of Yogashima.

(*ζακαλλής*, very beautiful.)

37. *PTEROGOBIOUS ZONOLEUCUS* Jordan and Snyder, new species.

Head $4\frac{1}{5}$ in length; depth $4\frac{5}{8}$; depth of caudal peduncle $2\frac{1}{4}$ in head; eye $3\frac{1}{8}$; snout $3\frac{3}{8}$; maxillary $2\frac{3}{4}$; D. VIII-20; A. 19; P. 21; scales in lateral series 66, in transverse series 21.

Body large; deep; compressed, the caudal peduncle notably so. Head small, pointed, deeper than broad. Eye very large; directed laterally; interorbital space flat; its width equal to diameter of eye; preorbital area narrow. Mouth oblique; jaws subequal. Maxillary concealed, extending to a vertical between pupil and anterior edge of orbit. Tongue of medium width, its anterior edge concave. Teeth simple; in narrow bands on both jaws; outer ones much enlarged; those of upper jaw, rather larger before, growing gradually smaller

posteriorly; lower jaw with 2 or 3 much enlarged teeth near the symphysis, these followed on each side by a few smaller ones; then 2 larger curved canines, after which the teeth are abruptly smaller. Gill opening not extending very far forward; the width of isthmus about equal to diameter of eye. No papillæ on inner edge of shoulder girdle. Gill-rakers slender.

Head naked except on occiput; body everywhere covered with small, finely ctenoid scales.

Dorsals separate; spines slender; the first short; the second, third, fourth, and fifth notably elongated; the others much shorter though having free tips; rays somewhat longer anteriorly than posteriorly. Anal inserted below base of fourth or fifth dorsal rays; when depressed, reaching as far posteriorly as does the dorsal; both falling far short of

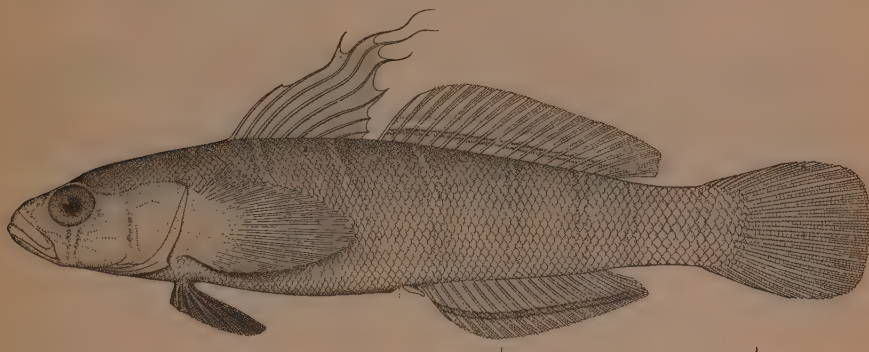


FIG. 19.—*PTEROGOBIOUS ZONOLEUCUS*.

base of caudal. Caudal truncate or very obtusely rounded. Pectorals with free filaments on upper edge; 2 filaments to each ray bearing them. Ventrals short; free posteriorly.

Color rather dark above, with 8 narrow, indistinct, light, vertical bands; fins dusky; the soft dorsal with 2 dark longitudinal bands; the upper being lighter and less distinct than the lower; anal with a dark longitudinal band; ventrals almost black.

Type No. 6454, Leland Stanford Junior University Museum, from Misaki, Japan.

A smaller specimen from the same locality has larger eyes; is much lighter in color, showing just a trace of the vertical bands. No bands can be distinguished on the fins.

Three specimens were obtained about the rocks of Yoga Island at Misaki.

(ζώνη, zone; λευκός, white.)

Measurements of Pterogobius zonoleucus.

Length in millimeters.....	71	42	44
Depth expressed in hundredths of length.....	22	22½	20
Depth of caudal peduncle.....	12	12½	12
Length of head.....	24	27	26
Length of snout.....	6	7	6½
Length of maxillary.....	9	9	9
Width of interorbital space.....	5	7	6
Diameter of orbit.....	6	8	7½
Distance from snout to spinous dorsal.....	35	35	34
Distance from snout to soft dorsal.....	56	53	53
Height of longest dorsal spines.....	31	18	20
Height of longest dorsal rays.....	13	15	13
Distance from snout to anal fin.....	62	58	60
Height of longest anal rays.....	12	13	13
Length of caudal peduncle.....	17	18	16
Length of caudal fin.....	23	23	21
Length of pectoral fin.....	22	26	23
Length of ventral fin.....	14	16	15
Number of dorsal spines.....	8	8	8
Number of dorsal rays.....	20	20	22
Number of anal rays.....	19	20	20
Number of scales in lateral series.....	66	63	65
Number of scales in transverse series.....	21	19	22

18. SURUGA Jordan and Snyder.

Suruga JORDAN and SNYDER, new genus (*fundicola*).

Body moderately elongate, covered with rather large, finely ctenoid deciduous scales; head large, not depressed; the interorbital space very narrow; eyes very large, longer than the short, blunt snout; cheeks scaleless; mouth rather large, very oblique; the chin prominent; teeth rather strong; tongue not notched; isthmus broad, the gill openings not continued forward below; fins all low; dorsal of eight spines and 17 to 20 rays; pectorals modearte, without silk-like rays; ventrals well developed.

Small plainly colored gobies inhabiting considerable depths in the sandy bays; allied to *Aboma*, but with the long soft dorsal and anal of *Acanthogobius*, and having the eyes larger than in any of the shore species.

(*Suruga*, name of the bay where especially abundant; Japanese, *suru*, stork; *ga*, good; the bay of the good stork.)

38. SURUGA FUNDICOLA Jordan and Snyder, new species.

Head $3\frac{3}{4}$ in length; depth $5\frac{1}{2}$; depth of caudal peduncle $3\frac{2}{5}$ in head; eye $2\frac{4}{5}$; snout 4; maxillary $2\frac{1}{4}$; D. VIII-18; A. 16; P. 21; scales in lateral series about 41, in transverse series about 12.

Head deeper and broader than body. Eye notably large; directed obliquely upward; interorbital space very narrow, the eyes nearly meeting above. Snout short; its length about equal to distance from anterior edge of orbit to posterior edge of pupil. Mouth large; oblique. Maxillary concealed except at its posterior end, extending to a vertical through pupil. Jaws equal. Teeth in narrow bands on both jaws, not close-set, simple; those of outer series of upper jaw much enlarged; the corresponding ones of lower jaw slightly enlarged. Tongue thick, rather broad, round anteriorly. Gill openings broad

but not extending far forward. No papillæ on inner edge of shoulder girdle. Gill-rakers long and very slender, 3 + 8 on first arch. No barbels on jaw.

Head naked; body, except part of nape, region anterior to pectorals, and breast covered with finely ctenoid scales, the rough edge of which is easily effaced; a triangular patch of small round scales extending forward on nape. The scales are easily displaced, nearly all of our specimens having them entirely removed.

Spines of dorsal long; slender, filamentous at tips, when depressed reaching insertion of soft dorsal; rays somewhat shorter than the

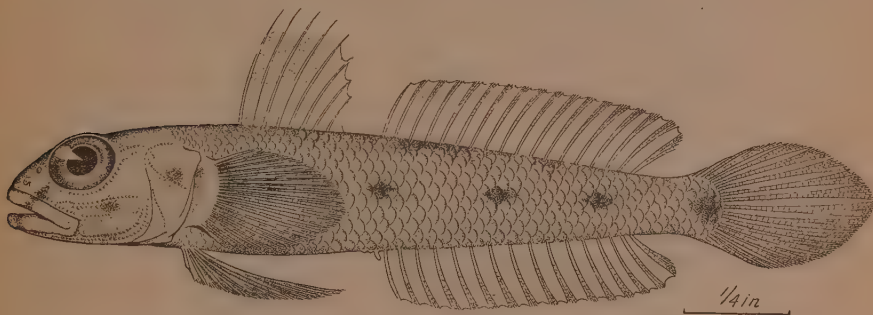


FIG. 20.—*SURUGA FUNDICOLA*.

spines. Anal inserted below third or fourth dorsal ray; extending posteriorly as far as the dorsal, both reaching base of caudal. Pectorals rounded; the upper edge without filaments. Caudal pointed. Ventrals long, free posteriorly.

Color dusky above; darker on snout; 6 or 7 indefinite dusky spots on sides; fins dusky.

Type No. 49744, U. S. N. M. Co-type No. 6456, Leland Stanford Junior University Museum, dredged at a depth of 65 fathoms, station 3745, off Sagami, by the United States Fish Commission steamer *Albatross*.

We have examined very many specimens from Suruga Bay, Matsushima, Owari Bay, and from the coast of Sagami. All are from sandy bottom at a depth of 40 to 80 fathoms.

(*Fundus*, bottom; *colo*, inhabit.)

Measurements of Suruga fundicola.

Length in millimeters	63	54	54	50
Depth expressed in hundredths of length	18	16	17	16
Depth of caudal peduncle	7	7	7	7½
Length of head	27	26	26	26
Length of snout	7	5	6	6
Length of maxillary	10	10	10	11
Width of interorbital space	1	1	1	1
Diameter of orbit	9½	9½	10½	11
Distance from snout to spinous dorsal	35	32	36	33
Distance from snout to soft dorsal	52	52	54	52
Height of longest dorsal spines	17	16	16	16
Height of longest dorsal rays	13	13	15	13
Distance from snout to anal fin	58	58	58	56
Height of longest anal rays	13	8	13	13
Length of caudal peduncle	10	10	13	14
Length of caudal fin	25	24	26	25
Length of pectoral fin	22	22	22	22
Length of ventral fin	22	20	21	20
Number of dorsal spines	8	8	8	8
Number of dorsal rays	19	18	17	17
Number of anal rays	18	17	16	17
Number of scales in lateral series <i>a</i>	40	44	38	40
Number of scales in transverse series <i>a</i>	12	10	10	10
Locality, Suruga Bay.				*

a Careful estimates only, as the scales had all been displaced, and even the scale pouches had in some specimens been rubbed off.

19. ACANTHOGOBIUS Gill.

Acanthogobius GILL, Proc. Ac. Nat. Sci. Phil., 1859, p. 145 (*flavimanus*).

Body oblong, little compressed, covered with medium-sized roughish scales; cheeks with small scales; snout rather long, the head rounded in profile; mouth moderate, oblique, the jaws about equal, the teeth moderate; tongue truncate or very slightly notched; isthmus rather broad, the gill openings slightly continued forward below; no flaps on shoulder girdle. Dorsal fins rather long, the first of 7 to 9 slender spines, the second of 14 or 15 soft rays; anal of 12 to 13.

Species of large size inhabiting the rivers and shores of Japan. The genus is near *Aboma*, differing in the scaly cheeks and longer second dorsal.

(ἄκανθα, spine; *Gobius*.)

39. ACANTHOGOBIUS FLAVIMANUS (Schlegel).

Gobius flavimanus SCHLEGEL, Fauna Japonica, 1847, p. 141, pl. LXXIV, fig. 1, Nagasaki.—BLEEKER, Ver. Bat. Genootsch., Japan, p. 42.—GÜNTHER, Cat. Fish., III, 1861, p. 77, after Schlegel.—ISHIKAWA, Cat. Fish., 1898, p. 38, Rikuzen, Yechizo, Hokkaido, Tokyo.

Acanthogobius flavimanus GILL, Proc. Ac. Nat. Sci. Phila., 1859, p. 145, Shimoda.

Head $3\frac{2}{5}$ in length; depth $5\frac{3}{4}$; depth of caudal peduncle $3\frac{1}{2}$ in head; eye 6; snout $2\frac{3}{8}$; maxillary $2\frac{1}{6}$; D. VIII-14; A. 12; P. 19; scales in lateral series 48, in transverse series 17.

Body elongate, somewhat cylindrical anteriorly; the caudal peduncle compressed. Head large; snout rather blunt. Eyes small, high up, directed obliquely; interorbital space concave; distance between eyes less than their diameter. Mouth very large, oblique; jaws equal; lips broad; maxillary concealed, extending to a vertical through anterior

part of pupil. Tongue broad, truncate, with but a narrow free margin. Teeth simple, small, in narrow bands on both jaws. Anterior nostrils with low rims. No barbels. Gill openings not extending far forward; the isthmus broad, its width about equal to $1\frac{1}{2}$ times diameter of eye. Inner edge of shoulder girdle with a narrow ridge, but no papillæ. Gill-rakers on first arch $3 + 9$, short, rather thick.

Head with scales on upper parts of opercles and cheeks, and on occiput; those on cheeks small, round, difficult to detect. Body completely covered with large ctenoid scales, except on nape and breast, where they are small and cycloid; those of breast minute.

Dorsals separate, the spines slender, when depressed reaching insertion of second dorsal. Anal inserted below base of third or fourth dorsal rays, when depressed reaching posteriorly about as far as the dorsal, both touching base of caudal. Pectorals and caudal pointed or acutely rounded; upper edge of the former without filaments. Ventrals large; free posteriorly.

Color light yellowish olive; dusky above; sides with 5 very indistinct spots; snout rather darker than body. Dorsals with dusky spots arranged in oblique rows; upper two-thirds of caudal with zigzag dusky bands; the lower third of fin plain dusky; pectorals with a little dark color at base; ventrals and anal with some dark color. In some specimens the ventrals and anal have scarcely a trace of dark color, while in others they are dusky, often approaching black. The latter condition is found to obtain usually in the males, although males with light fins and females with dark ones have been observed.

Described from specimens collected at Wakanoura, Kii.

One of the most abundant fishes of Japan, reaching a length of 200 to 250 millimeters, and abounding in all sluggish rivers and estuaries. We have numerous representatives from Hakodate, Onomichi, Kurume, Nagasaki, Wakanoura, Misaki, Matsushima, Aomori, Tokyo, Tsuruga, Enoshima, Niigata, and the Yodo River, near Osaka.

(*Flavus*, yellow; *manus*, hand.)

Measurements of *Acanthogobius flavimanus*.

	Tokyo Bay.			Nagasaki, Hizen.		
Length in millimeters	137	143	132	123	118	121
Depth expressed in hundredths of length	18	14	16	17	20	18
Depth of caudal peduncle	10	9	10	9 $\frac{1}{2}$	10	9 $\frac{1}{2}$
Length of head	28	28	28	26	28	28
Length of snout	10	10	10	10	10 $\frac{1}{2}$	11
Length of maxillary	10 $\frac{1}{2}$	10	10 $\frac{1}{2}$	10	10	10
Width of interorbital space	2	2	2	2	2	2
Diameter of orbit	5	5	5 $\frac{1}{2}$	6	5 $\frac{1}{2}$	6
Distance from snout to spinous dorsal	35	34	34 $\frac{1}{2}$	33	36	36
Distance from snout to soft dorsal	55	54	53 $\frac{1}{2}$	55	56	56
Height of longest dorsal spines	14	13 $\frac{1}{2}$	13	11	13	15
Height of longest anal rays	13	14	13	12	12 $\frac{1}{2}$	12
Distance from snout to anal fin	60	58	60	58 $\frac{1}{2}$	62	59
Height of longest anal rays	12	11	11	9 $\frac{1}{2}$	10 $\frac{1}{2}$	11 $\frac{1}{2}$
Length of caudal peduncle	21	21	20	22	21	22 $\frac{1}{2}$
Length of caudal fin	26	24	27	21	22	23
Length of pectoral fin	20	19	20	16	18	18
Length of ventral fin	19	18	17	14	15	18
Number of dorsal spines	8	8	8	8	8	8
Number of dorsal rays	14	14	14	14	14	14
Number of anal rays	11	12	12	12	12	12
Number of scales in lateral series	44	48	47	48	50	50
Number of scales in transverse series	17	18	17	16	17	18

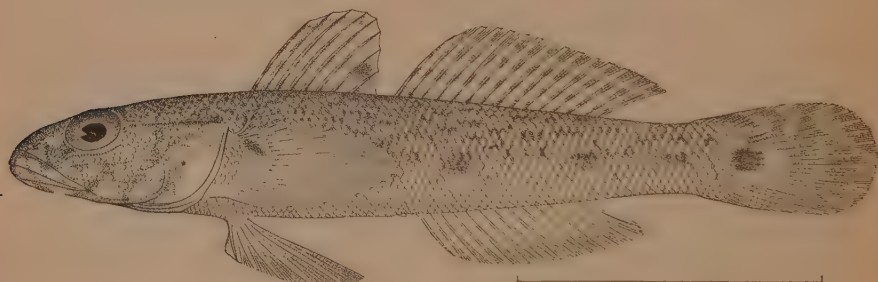


FIG. 21.—SAGAMIA RUSSULA.

20. SAGAMIA Jordan and Snyder, new genus.

Sagamia JORDAN and SNYDER, new genus (*russulus*.)

This genus agrees with *Acanthogobius* in nearly all respects, differing in the presence of free silky rays on the pectorals, as in *Gobius*, *Pterogobius*, and *Chasmias*. Japanese.

(Name from Sagami Bay.)

40. SAGAMIA RUSSULA Jordan and Snyder, new species.

Head $3\frac{1}{3}$ in length; depth $5\frac{2}{3}$; depth of caudal peduncle 3 in head; eye $3\frac{1}{2}$; snout $3\frac{1}{2}$; maxillary $2\frac{2}{3}$; D. VIII-15; A. 14; P. 21; scales in lateral series $5\frac{1}{2}$, in transverse series 16.

Body rather long, somewhat cylindrical, a little less wide than deep, caudal peduncle deep. Eyes very large, rather oblong, directed upward, nearer tip of snout than posterior edge of opercle a distance equal to one-half their diameter; interorbital space very narrow, slightly concave. Snout blunt; nostrils with slight rims, the anterior of which is the higher; width of preorbital area equal to diameter of pupil. Jaws subequal, the lower just included; maxillary extending to a vertical midway between pupil and anterior edge of eye; concealed beneath preorbital except at its distal end. No barbels. Tongue very

broad, the anterior edge concave. Teeth on jaws in 2 rows; the outer ones enlarged; the inner ones minute; a strong canine on each side of lower jaw curving backward. Gill opening extending above to upper edge of base of pectoral; the width of isthmus equal to diameter of eye. No projection on inner edge of shoulder girdle. Gill-rakers on first arch $2 + 11$; slender; the length of the longest about equal to diameter of pupil. Cheeks with 4 rows of elevated mucous pores; the first just below the eye; the third, branched posteriorly, joining the fourth and curving upward around the anterior edges of the first and second; a double row along the lower and posterior edges of preopercle, extending forward on lower jaw; 2 rows on opercle; one extending downward, and the other backward from its upper anterior angle; a row running backward from eye, above opercle to upper edge of gill opening; a conspicuous pore above and between the nostrils; rows of minute pores on upper part of snout.

Head, except snout, lower jaw, throat, and opercle, except its upper part, with cycloid scales. Body with rather small, finely ctenoid scales.

Dorsal fins separate; the spines not elongate; the longest contained twice in head; rays a little shorter than spines. Anal inserted below third or fourth dorsal ray; the depressed fin extending as far posteriorly as does the dorsal, both falling far short of base of caudal. Caudal acutely rounded. Pectorals pointed; reaching a vertical through insertion of soft dorsal; the upper edge with 4 or 5 slender filaments. Ventrals free posteriorly; extending to a point as far before vent as the insertion of anal is behind.

Color in spirits soiled white; upper parts with dark spots and reticulations; sides with 7 or 8 dark spots, indistinct anteriorly, better defined posteriorly; the last of the series at base of caudal fin, very prominent; a small spot on upper part of base of pectoral; 3 poorly defined, oblique lines on sides of head, the posterior one on opercle; the anterior one running forward and downward from eye. Spinous dorsal with a dark spot near ends of last two spines; with 3 longitudinal rows of dark spots; soft dorsal with 4 longitudinal rows of dark spots; anal edged with dusky; upper part of caudal with vertical, wavy, dark bands; pectorals and ventrals suffused with dusky. In life bluish olive; the lateral spots rather bright brick red with darker centers.

Described from Type No. 6457, Leland Stanford Junior University Museum. Locality, Misaki, Sagami, Japan.

Specimens from Nagasaki are much lighter in color, though preserving in an indefinite way the general markings of the type. The spinous dorsals have 2 dark spots, one situated anteriorly, the other posteriorly.

We have many specimens from Misaki, Wakanoura, and Nagasaki. It is one of the commonest species found in the clear waters of the bays; never in the rivers.

(*Russulus*, reddish.)

Measurements of *Sagamia russula*.

	Misaki, Sagami.		Nagasaki, Hizen.							
Length in millimeters.....	61	53	63	63	64	62	58	57	47	44
Depth expressed in hundredths of length.	16	16	18	16	15	16	17	16	16	18
Depth of caudal peduncle.....	9	9	10	10	10	9	10	10	9	9
Length of head.....	30	31	30	29	27	30	30	28	29	30
Length of snout.....	10	9	9	8	8	9	8	9	8	9
Width of interorbital space.....	11	2	2	2	2	2	2	2	2	2
Diameter of orbit.....	8	9	8	8	8	9	8	9	8	9
Distance from snout to spinous dorsal.....	34	37	36	33	33	36	35	34	35	36
Distance from snout to soft dorsal.....	55	55	56	54	53	55	56	54	52	56
Height of longest dorsal spines.....	15	14	15	14	16	15	18	16	17	17
Height of longest dorsal rays.....	13	14	16	16	13	14	15	16	15	16
Distance from snout to anal fin.....	58	56	57	57	56	58	59	59	58	58
Height of longest anal rays.....	10	10	10	10	11	12	12	12	13	11
Length of caudal peduncle.....	18	20	21	21	21	20	22	21	21	20
Length of caudal fin.....	21	23	22	20	21	22	22	22	22	21
Length of pectoral fin.....	22	25	24	24	23	25	22	23	24	25
Length of ventral fin.....	19	20	22	20	19	23	19	21	20	23
Number of dorsal spines.....	8	8	8	8	8	8	8	8	8	8
Number of dorsal rays.....	15	15	14	15	15	15	15	15	15	15
Number of anal rays.....	14	14	13	14	13	14	13	13	14	14
Number of pectoral rays.....	21	20	21	22	22	20	20	21	20	20
Number of scales in lateral series.....	51	49	53	54	55	51	55	55	57	52
Number of scales in transverse series.....	16	16	16	16	17	17	17	16	17	16

21. SYNECHOGOBIOUS Gill.

Synechogobius GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 266 (*hasta*).

This genus seems to be closely allied to *Acanthogobius*, differing in the more elongate body and fins and in the naked head. From *Gobionellus*, an American genus of similar form, it differs in the presence of 8 or 9 dorsal spines. The single known species is Japanese.

(συνέχω, repeat; *Gobius*, the form repeating the elongate body and lanceolate caudal of *Gobionellus*.)

41. SYNECHOGOBIOUS HASTA (Schlegel).

Gobius hasta SCHLEGEL, Fauna Japonica, Fishes, p. 144, pl. LXXV, fig. 1, Nagasaki.—GÜNTHER, Cat. Fishes, III, 1861, p. 78, Japan.

Head $5\frac{1}{2}$ in length; depth 10; D. VIII-20; A. 17; P. 22.

Body elongate; caudal peduncle long and slender. Eyes small; high up; interorbital width equal to vertical diameter of eye. Snout rather long; pointed; jaws equal; mouth oblique. Maxillary extending to a vertical through anterior edge of orbit. Teeth in bands, the outer ones slightly enlarged. Head naked; no barbels. Body with rather large scales.

Dorsals separate; the spines slender, their tips filamentous; when depressed not reaching insertion of soft dorsal. Anal inserted below base of fourth dorsal ray; when depressed, reaching about as far posteriorly as does the dorsal, neither fin touching base of caudal. Caudal pointed. Pectoral pointed; its upper edge without filaments. Ventrals free posteriorly.

Color brownish green; pectoral, anal, and lower part of caudal suffused with brownish red; soft dorsal with elongate dusky spots in longitudinal rows. (Schlegel.)

Nagasaki, not seen by us.

(*Hasta*, a dart).

22. PARACHÆTURICHTHYS Bleeker.

Parachæturichthys BLEEKER, Archives Néerl., 1874, p. 325 (*polynemus*).

Body moderately elongate, covered with rather large, ctenoid scales; head rounded in profile, not depressed above, the eyes close together; cheeks scaly; mouth moderate, oblique, the chin not very prominent; teeth moderate, simple; chin with many small barbels on each side along the ramus of the lower jaw; dorsal fins short, the rays about VI-11. Caudal pointed with a black ocellus at base above; pectorals pointed, without silk-like rays; ventrals united, not adnate to the belly. Isthmus broad, the gill openings not continued forward below.

One species, in the Japanese and Indian seas.

(*παρά*, near; *Chæturichthys*.)

42. PARACHÆTURICHTHYS POLYNEMUS Bleeker.

Chæturichthys polynema BLEEKER, Verh. Batav. Genoots., XXV, Japan, p. 44, fig. 4, Nagasaki.

Gobius polynema GÜNTHER, Cat. Fish., III, 1861, p. 46, China, Madras.

Head $4\frac{1}{2}$ in length; depth $5\frac{1}{4}$; depth of caudal peduncle $2\frac{1}{4}$ in head; eye $3\frac{1}{2}$; snout $3\frac{5}{8}$; maxillary $2\frac{3}{8}$; D. VI-11; A. 10; P. 22; scales in lateral series 28, in transverse series 9.

Body elongate, somewhat compressed; caudal peduncle deep, much compressed. Head broader than body, but a little less deep. Snout blunt. Eye large, the upper edge projecting slightly above dorsal contour of head; interorbital area concave; the space between the eyes equal to their vertical diameter. Mouth oblique; jaws equal. Maxillary entirely concealed, extending posteriorly to a vertical through center of pupil. Tongue rather narrow, rounded anteriorly. Teeth simple, in narrow bands on both jaws, the outer ones slightly enlarged; no canines. Gill opening not extending far forward; width of isthmus equal to diameter of eye. Inner edge of shoulder girdle without papillæ. Gill-rakers $3 + 10$, rather short and blunt. Anterior nostril with a low tube. Lower jaw with a row of slender barbels along under sides of rami; branchiostegal region with barbels.

Cheeks, occiput, interorbital space, and posterior part of snout with cycloid scales. Body everywhere covered with large scales, those on nape and anterior under parts cycloid, the others finely ctenoid.

Dorsal fins separate; the spinous dorsal when depressed not reaching insertion of soft dorsal; the rays longer posteriorly. Anal inserted below base of second or third dorsal ray; its rays when depressed reaching as far posteriorly as do those of the dorsal, both touching bases of caudal rays. Caudal pointed. Pectoral pointed, its upper edge without filaments. Ventrals rather short; free posteriorly.

Body with considerable dusky color, a little lighter below than

above. Fins dusky, growing darker toward the edges; caudal with a conspicuous, black, oval spot about as large as eye on upper half; the spot surrounded by a lighter border.

Described from a specimen from Wakanoura. Representatives from other localities show no important differences.

The species may be recognized at once among Japanese gobies by the large, oval, black spot on the upper half of the caudal fin.

Our collections include individuals from Tsuruga, Kobe, Nagasaki, Wakanoura, Hiroshima, and Onomichi. The species is generally common in Southern Japan and grows to a length of 150 millimeters.

(πολύς, many; νῆμα, thread.)

Measurements of Parachæturichthys polynemus.

	Nagasaki, Hizen.		Wakanoura, Kii.		
Length expressed in millimeters.....	100	90	85	95	78
Depth expressed in hundredths of length.....	20	18	19	19	21
Depth of caudal peduncle.....	13	12	12	11	11
Length of head.....	25	25	24	24	25
Length of snout.....	6½	6	5½	6	5
Length of maxillary.....	10	10	10	10	9½
Width of interorbital space.....	3½	2	3	3	2½
Diameter of orbit.....	7	7½	7	7	7
Distance from snout to spinous dorsal.....	35	35	35	33	35
Distance from snout to soft dorsal.....	53	54	52	52	53
Height of longest dorsal spines.....	13	12	13	12	13
Height of longest dorsal rays.....	18	19	19	19	18
Distance from snout to anal fin.....	59	59	57	56	58
Height of longest anal rays.....	16½	19	19	18	18
Length of caudal peduncle.....	23	23	22	23	24
Length of caudal fin.....	36½	41	44	43	38
Length of pectoral fin.....	27	29	31	30	27
Length of ventral fin.....	18	17	18	17	17
Number of dorsal spines.....	6	6	6	6	6
Number of dorsal rays.....	11	11	11	11	11
Number of anal rays.....	10	10	10	10	10
Number of scales in lateral series.....	28	28	28	28	27
Number of scales in transverse series.....	9	9	9	9	9

23. CHÆTURICHTHYS Richardson.

Chaturichthys RICHARDSON, Voyage Sulphur, 1844, p. 55 (*stigmatias*).

Amblychaturichthys BLEEKER, Archives Néerl., 1874, p. 324 (*hexanemus*).

Body moderately elongate, covered with moderate-sized cycloid scales, which fall readily; head broad, rounded in profile, the eyes close together, the cheeks scaly; mouth moderate, oblique; the teeth pointed, medium; tongue truncate; isthmus narrow, the gill openings continued well forward below; lower jaw with 3 small barbels on either side. Dorsal fins long of 8 slender spines and 14 to 25 rays. Caudal more or less pointed, with shorter rays at base above and below; pectorals pointed, without silky rays.

Species few, mostly Japanese. Large gobies of dull coloration, chiefly of the seas of Japan and China.

(χαίτη, bristle; ὄψα, tail; ἰχθύς, fish, from the short marginal rays of the caudal.)

a. *Chæturichthys*. Dorsal rays VIII-22; anal 19; scales 57-14; caudal long and pointed; spinous dorsal with a large black spot.....*stigmatias*. 43

aa. *Amblychaturichthys*. Dorsal rays VIII-15 to 17; anal 13 or 14; scales 35 to 40; caudal shorter.

- b. Dorsal rays VIII-17; scales 39-15; color soiled olive without distinct markings; first dorsal without distinct black spot.....*hecanemus*. 44
 bb. Dorsal rays VIII-15; scales 35-10; color olivaceous; a large black ocellus on spinous dorsal.....*scistioides*. 45

43. CHÆTURICHTHYS STIGMATIAS Richardson.

Chaeturichthys stigmatias RICHARDSON, Voy. Sulphur, 1844, p. 55, locality uncertain—

JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1901, p. 764, Tsushima.

Gobius stigmatias GÜNTHER, Cat. Fish., III, 1861, p. 78, from Richardson's type.

Head $3\frac{2}{3}$ in length; depth 7; depth of caudal peduncle $4\frac{2}{3}$ in head; eye $4\frac{2}{3}$; snout $3\frac{1}{2}$; maxillary 2; D. VIII-22; A. 19; P. 24; scales in lateral series about 57, in transverse series about 14.

Body elongate posteriorly, the dorsal and ventral contours sloping gradually to the caudal peduncle, which is narrow and compressed. Head large; wider than body; the width equal to distance from tip of snout to posterior border of eye.

Eyes high in head; oblong; directed obliquely upward, more of the eye being visible when viewed from above than when seen from the side. Interorbital space slightly concave. Mouth large; oblique; lower jaw projecting somewhat beyond the upper; lips thin; maxillary extending to a perpendicular through middle of pupil; entirely concealed beneath a pendulous dermal fold of the suborbital. Tongue broad; concave anteriorly. Teeth in 2 rows on each jaw; slender, pointed and curved; those in outer row stronger and fang-like. Gill opening extending far forward, the isthmus narrow. Three large papillae on inner edge of shoulder girdle. Gill rakers on first arch 3 + 11; long and slender. Lower jaw with 3 barbels on each side, the distance between them equal to the diameter of the orbit; anterior barbel shorter and thicker than the others.

Occiput, opercles, and preopercles with small, round, smooth scales, scarcely or not at all imbricated. Body with cycloid scales, small near the head, growing larger posteriorly.

Dorsal fins separate; the first 6 spines evenly spaced, the others farther apart. When depressed the fin does not extend to insertion of soft dorsal. Dorsal rays growing higher from before backward; when depressed, reaching base of upper caudal rays. Anal inserted below base of third dorsal ray; the rays not reaching so far posteriorly when depressed as do those of the dorsal. Caudal long, pointed, with short accessory rays above and below (hence the name "*Chaeturichthys*"); short dorsal and ventral rays of the fin growing far forward on the caudal peduncle. Pectorals pointed, extending to vent. Ventrals free from body posteriorly, extending to a point below base of seventh dorsal spine.

Body without distinctive color markings. Spinous dorsal with a large black spot on its posterior border. Soft dorsal, caudal, and pectorals

with indistinct dark wavy markings. Ventrals and anal without dark markings except a little dusky on posterior border of the latter.

This species, the habitat of which was heretofore unknown, is represented in our collection by 2 poorly preserved specimens obtained by P. L. Jouy at Sasuna, island of Tsushima, Japan. Richardson's specimens collected by the *Sulphur* were in a bottle labeled "Southern Pacific," but Richardson observes, "As the bottle held several species from the China Sea, there appears some doubt as to the native place of the fish." It probably came from China.

(*στιγματίας*, branded.)

Measurements of Chaeturichthys stigmatias.

Length in millimeters	79	92
Depth expressed in hundredths of length	15	15
Depth of caudal peduncle	6	5
Length of head	29	27
Length of snout	9	8
Width of interorbital space	4½	4½
Diameter of orbit	6	6
Distance from snout to spinous dorsal	34	33
Distance from snout to soft dorsal	52	51
Height of longest dorsal spines	13	12
Height of longest dorsal rays	14	12
Distance from snout to anal fin	56	57
Height of longest anal rays	13	11
Length of caudal peduncle	16	16
Length of caudal fin	32	23
Length of pectoral fin	24	23
Length of ventral fin	20	18
Number of dorsal spines	8	8
Number of dorsal rays	22	21
Number of anal rays	19	20
Number of pectoral rays	24	25
Number of scales in lateral series	a 67	a 50
Number of scales in transverse series	a 14	a 14

a The above counts are only approximately correct, the specimens being so poorly preserved that but few of the scales remain in place.

44. *CHÆTURICHTHYS HEXANEMUS* (Bleeker).

Chaeturichthys hexanema BLEEKER, Verh. Batav. Genootsch., XXV, Japan, p. 435,

Nagasaki—GILL, Ann. Lyc. Nat. Hist. N. Y., 1859, p. 16, Shimoda—

JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, Lake Biwa.

Gobius hexanema GÜNTHER, Cat. Fish., III, 1861, p. 77; after Bleeker.

Head $3\frac{2}{3}$ in length; depth $5\frac{1}{3}$; depth of caudal peduncle $2\frac{2}{3}$ in head; eye $4\frac{1}{4}$; snout $3\frac{3}{8}$, maxillary $2\frac{2}{3}$; D. VIII-17; A. 14; P. 23; scales in lateral series 39, in transverse series 15.

Body thick-set. Snout blunt. Eyes high in head, directed obliquely upward, nearer tip of snout than to posterior end of opercular flap a distance equal to their diameter; width of interorbital space equal to diameter of pupil. Anterior nostril with a slight rim. Mouth large, oblique; lower jaw slightly projecting. Maxillary entirely concealed beneath preorbital; extending posteriorly to a vertical through a point midway between pupil and anterior edge of orbit. Lower jaw with 3 pairs of slender barbels; each of the anterior pair inserted on either side of a large pore at angle of lower jaw; others just posterior, at intervals equal to diameter of orbit. Teeth on jaws in bands, bristle-like; outer ones slightly enlarged; no canines. Gill openings extend-

ing far forward below; the isthmus narrow. No protuberances on inner edge of shoulder girdle. Gill-rakers on first arch 14, slender.

Head, except anterior part of snout, lower jaw, and throat, with ctenoid scales; body with large ctenoid scales.

Dorsals separate; the height of longest spines contained about 3 times in length of head, rays somewhat longer; spinous dorsal when depressed just reaching insertion of soft dorsal; the latter touching bases of upper caudal rays. Anal inserted below base of fifth dorsal ray; posterior rays longest, not extending so far posteriorly when depressed as do those of dorsal. Caudal and pectorals pointed; the latter without filaments on upper edge. Ventrals free posteriorly.

Color dusky olive; sides with a row of 5 dark spots; the posterior ones, especially that at base of caudal most conspicuous. Fins dusky; the ventrals with a wide, light, posterior border.

Here described from a specimen 130 millimeters long from Nagasaki.

We have specimens from Tsuruga, Owari Bay, Aomori, Tokyo, Matsushima, Mororan, Hakodate, and Nagasaki. The species is extremely common throughout Japan, in all bays and estuaries. It reaches a length of 150 to 200 millimeters. It is called *Akahaze* or red Goby.

($\xi\xi$, six; $\nu\tilde{\eta}\mu\alpha$, thread.)

Measurements of *Chæturichthys hexanemus*.

Length in millimeters.....	134	127	115	95	90
Depth expressed in hundredths of length.....	20	19	18	19	20
Depth of caudal peduncle.....	10	10	9½	10	10
Length of head.....	26	25½	26	26½	27
Length of snout.....	7	7½	7½	7	7½
Length of maxillary.....	10	10½	11	10½	10
Width of interorbital space.....	2½	2½	2½	2½	2
Diameter of orbit.....	7	6½	7	7½	8
Distance from snout to spinous dorsal.....	34	33½	33½	32	35
Distance from snout to soft dorsal.....	52	52½	54	52½	53
Height of longest dorsal spines.....	13½	13	13½	14	13
Height of longest dorsal rays.....	16½	16½	15	14	15
Distance from snout to anal fin.....	59	59	59	59½	60
Height of longest anal rays.....	18	16½	16	15	16
Length of caudal peduncle.....	25½	22½	22	22	22
Length of caudal fin.....	34	32½	33	30	26
Length of pectoral fin.....	19	18½	18	19	20
Length of ventral fin.....	17	16	16	16½	16½
Number of dorsal spines.....	8	8	8	8	8
Number of dorsal rays.....	17	17	17	17	17
Number of anal rays.....	13	14	14	13	14
Number of scales in lateral series.....	42	46	42	40	43
Number of scales in transverse series.....	16	16	15	14	
Locality, Nagasaki.					

45. CHÆTURICHTHYS SCIISTIUS Jordan and Snyder, new species.

Head $3\frac{3}{5}$ in length; depth $5\frac{1}{4}$; depth of caudal peduncle $2\frac{3}{4}$ in head; eye 3; snout 4; maxillary $2\frac{1}{3}$; D. VIII-15; A. 12; P. 20; scales in lateral series 32, in transverse series 10.

Shape like that of *C. hexanemus*. Eye very large, the diameter greater than length of snout; directed obliquely upward; interorbital space narrow. Mouth oblique. Maxillary entirely concealed; extending to a perpendicular through posterior part of pupil. Lips thin. Tongue truncate anteriorly. Teeth simple, in 2 rows on each jaw,

those of the outer row slightly enlarged, extending farther back on jaw than do those of inner row; no canines. Gill opening extending far forward; the isthmus narrow. No protuberances on inner edge of shoulder girdle. Gill-rakers on first arch 4 + 13, very long and slender. Anterior nostril with a low rim. Lower jaw with 3 slender barbels on each side of inner edge.

Head with scales on opercles, preopercles, and on nape; other parts naked. Body with large cycloid scales.

Dorsal fins separate; spines slender; the filamentous tips projecting slightly beyond the membrane; the fin when folded just touching insertion of second dorsal; posterior rays of anal longest; reaching, when depressed, a little beyond bases of first upper caudal rays. Anal inserted below base of third or fourth dorsal ray; posterior rays much longer than the anterior ones; reaching almost as far backward when depressed as do those of the dorsal. Caudal pointed. Pectoral without free filaments on its upper edge; pointed posteriorly. Ventrals long; free posteriorly.

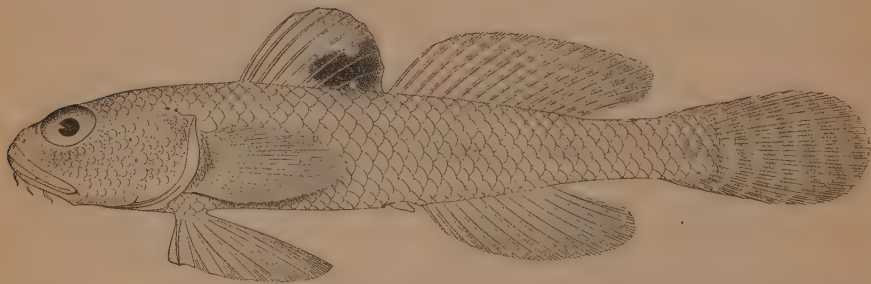


FIG. 22.—*CHAETURICHTHYS SCISTIUIS*.

Color in spirits yellowish white; sides with 5 or 6 very indistinct dusky spots, the most posterior of which is near base of anal; dorsal surface of body and upper part of head with a little dusky color. Spinous dorsal with a broad black blotch on posterior part; the dark area preceded by 2 or 3 rows of white spots; anterior part of fin dusky; soft dorsal dusky; with 2 narrow longitudinal light bands. Anal with 5 or 6 vertical zigzag dusky bands about equal in width to their light interspaces. Anal dusky. Pectorals and ventrals without light color.

Type No. 6458, Leland Stanford Junior University Museum. Locality, Hakodate, Hokkaido.

This species differs from *C. heranemus* in having fewer dorsal and anal rays and larger scales. It is lighter in color, has a conspicuous black spot on spinous dorsal, and is smaller in size. Some of our specimens were obtained offshore at a depth of 14 to 18 fathoms.

We have the species from Tsuruga, Owari Bay, Aomori, Tokyo,

Matsushima, Mororan, and Hakodate. It is found on sandy bottoms in rather deep water, and apparently rather to the northward.

(σκιά, shadow; ισρίον, sail, fin.)

Measurements of Chaturichthys scistiatus.

	Owari Bay.					Hakodate, Hokkaido.		
Length in millimeters.....	47	47	47	46	45	67	71	70
Depth expressed in hundredths of length.....	18	20	20	19	20	20	18	19
Depth of caudal peduncle.....	9	9	9	8	8	8	9	8
Length of head.....	27	28	28	26	28	28	27	26
Length of snout.....	7	6½	6	6½	7	7	7	7
Length of maxillary.....	12	12½	12	12	12	12	11	12
Width of interorbital space.....	2	2	2	2	2	1½	1½	2
Diameter of orbit.....	9	9	9	9	10	8	8	8
Distance from snout to spinous dorsal.....	36	34	36	34	36	36	35	35½
Distance from snout to soft dorsal.....	56	54	56	55	57	57	55	56
Height of longest dorsal spines.....	14	16	15	14	16	16	15½	15
Height of longest dorsal rays.....	19	16	19	19	16½	17	16	16½
Distance from snout to anal fin.....	59	60	61	58	62	62	62½	59
Height of longest anal rays.....	18		15	15		18	16	16
Length of caudal peduncle.....	23	22	22	22	20	21	20	22
Length of caudal fin.....	28	30	28	31	27	32	30	28
Length of pectoral fin.....	22	22	20	21	23	23	22	22
Length of ventral fin.....	22		21	22	22	22	21½	21
Number of dorsal spines.....	8	8	8	8	8	8	8	8
Number of dorsal rays.....	15	15	15	14	15	15	14	15
Number of anal rays.....	12	13	13	13	13	12	13	12
Number of scales in lateral series.....	32	33		32	31	35	31	36
Number of scales in transverse series.....	12	11		10	12	10	11	10

24. AINOSUS Jordan and Snyder, new genus.

Ainosus JORDAN and SNYDER, new genus (*geneionemus*).

This genus is allied to *Chaturichthys*, differing in the presence of about 10 barbels on either side, in the smaller, firmer, and rougher scales, the shorter soft dorsal, the free filaments on upper edge of pectoral, and in the truncate caudal fin. The isthmus is somewhat narrow, as in *Chaturichthys*, and the tongue is truncate.

The known species is small and spotted, resembling *Ctenogobius*, but with more dorsal spines and rays and with the numerous white barbels along the lower jaw.

(*Aino*, the name of the bearded aborigines of Japan, a lost offshoot from the Indo-European race of men.)

46. AINOSUS GENEIONEMUS (Hilgendorf).

Gobius geneionema HILGENDORF, Sitzgber. Naturf. Freunde, 1879, p. 108, Bay of Tokyo, No. 10653, Mus. of Berlin.

Head $3\frac{1}{2}$ in length; depth 4; depth of caudal peduncle 3 in head; eye $3\frac{2}{5}$; snout $3\frac{1}{5}$; maxillary 3; D. VIII-16; A. 14; P. 20; scales in lateral series 62.

Body elongate; cylindrical anteriorly. Head large; the snout rather sharp. Eyes large; the diameter about equal to length of snout; directed obliquely upward. Mouth oblique; jaws equal; maxillary entirely concealed; extending to a perpendicular through anterior edge of orbit. Teeth simple; in 2 well-separated rows on each jaw; the outer row enlarged; notably so in lower jaw where posteriorly they assume the shape of canines. Gill openings extending some dis-

tance forward; the width of isthmus slightly greater than diameter of pupil. Gill-rakers on first arch $2 + 9$; long and very slender. No papillæ on inner edge of shoulder girdle. Lower jaw and anterior part of throat with about 24 slender barbels; the longest somewhat shorter than diameter of pupil. Nostrils with rims, the anterior one the higher. Cheeks below eye with 4 rows of minute pores.

Head naked, except occiput and upper edge of opercle, which have small scales. Body completely covered with small ctenoid scales.

Fins large. Dorsals separate; the spines and rays of about the same height; much higher anteriorly than posteriorly; spines, when depressed, just reaching insertion of soft dorsal. Anal inserted below base of third dorsal ray; the tips of the rays not extending quite so far posteriorly as do those of the dorsal, both falling far short of base of caudal. Caudal truncate posteriorly; the upper rays slightly longer than the lower. Pectoral pointed; the upper edge with filamentous rays. Ventrals free posteriorly; extending a little beyond vent.

Color in spirits light; 6 or 7 large, dusky spots along middle of sides; a row of similar spots below these; upper parts of head and body with small, elongate spots, indistinct in outline; suborbital and cheeks with 4 oblique, parallel, dusky lines, the anterior extending from eye forward and downward. Spinous dorsal with 3 or 4 narrow, longitudinal, dusky bands; a large black blotch on the posterior membranes; soft dorsal with 3 bands similar to those of spinous dorsal. Caudal with oblong, dusky spots arranged in 3 or 4 zigzag vertical rows. Anal with a white margin, suffused with dusky between margin and base. Pectoral somewhat dusky. Ventral without dark color.

Here described from a small specimen collected at Misaki.

The species is as yet known only from about Tokyo, in clear water. It reaches a small size. Our specimens are from Misaki.

(*γένησιον*, chin; *νήμα*, thread.)

Measurements of Ainosus geneionemus.

Length expressed in millimeters	54	50	37	37
Depth expressed in hundredths of length...	16	17	18	17
Depth of caudal peduncle	9	10	9	9
Length of head	27½	30	30	31
Length of snout	8	10	8	8
Length of maxillary	9	9½	10	11
Width of interorbital space	2	2	2	2
Diameter of orbit	8	8	9	10
Distance from snout to spinous dorsal	34	34	36	37
Distance from snout to soft dorsal	53	53	55	55
Height of longest dorsal spines	16½	16	17	17
Height of longest dorsal rays	17½	16	18	20
Distance from snout to anal fin	56	58	58	57
Height of longest anal rays	12	12	16	12
Length of caudal peduncle	22	22	23	23
Length of caudal fin	20	20	23	25
Length of pectoral fin	22	23	25	24
Length of ventral fin	20	20	22	22
Number of dorsal spines	8	8	8	8
Number of dorsal rays	16	16	15	15
Number of anal rays	14	14	14	14
Number of scales in lateral series	61	62	59	62
Number of scales in transverse series	18	16	18	17

23. TRIÆNOPOGON Bleeker.

Triænopogon BLEEKER, Archives Néerl., 1874, p. 24 (*barbatus*).

This genus is close to *Tridentiger*, from which it differs in the presence of a conspicuous fringe of barbels, the one series along the sub-orbital and preorbital region, another along the edge of the preopercle and the rami of the lower jaw to the chin. Body very robust.

A single known species, from Japan, distinguished from all other gobies by the combination of barbels and trifid teeth.

(*τρίαινα*, three fork; *πώγων*, beard.)

47. TRIÆNOPOGON BARBATUS Günther.

Triænopogonichthys barbatus GÜNTHER, Cat. Fish., VII, 1861, locality unknown, "probably from China;" Hasler collection.

Tridentiger barbatus STEINDACHNER, Ichth. Beitr., VIII, 1879, p. 33, "Celebes or the Philippines."

Head 3 in length; depth $3\frac{1}{4}$; depth of caudal peduncle $2\frac{2}{5}$ in head; eye $2\frac{2}{3}$; snout $3\frac{1}{2}$; maxillary 2; D. VI-11; A. 10; scales in lateral series 36, in transverse series 14.

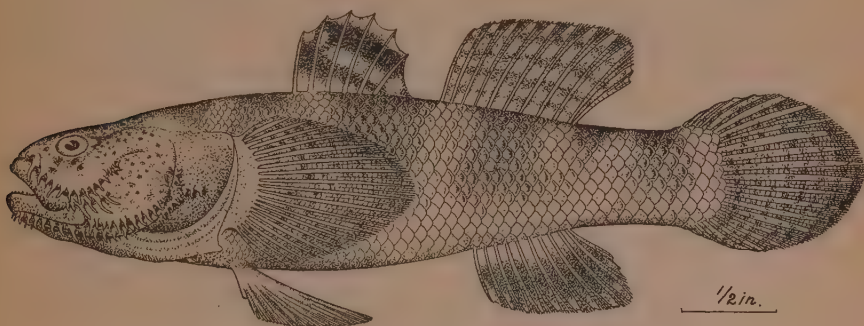


FIG. 23.—TRIÆNOPOGON BARBATUS.

Body stout; caudal peduncle deep, compressed. Head large, much broader than the body; cheek muscles bulging out conspicuously. Snout short, blunt. Mouth broad, somewhat oblique; jaws equal; distal part of maxillary exposed, extending much farther posteriorly than cleft of mouth, reaching a vertical passing a little beyond posterior edge of orbit. Tongue broad, rounded anteriorly.

Teeth of jaws in 2 series, the outer ones of upper jaw placed alternately in 2 rows; trilobed; the middle lobe much the highest, the inner ones in a single row, simple, small; the teeth of lower jaw in 2 rows; the outer trilobed; the inner simple, small; no canines.

Gill openings confined to the sides; the width of isthmus about equal to depth of caudal peduncle. No papillæ on inner edge of shoulder girdle. Gill-rakers on first arch 2 + 5 short, rather slender. Edge of suborbital with a double fringe of barbels which extends on cheek a

short distance beyond eye; lower jaw with 2 rows of barbels, which extend upward along edge of preopercle; opercle with a few scattered barbels. A conspicuous flap covering a pore near posterior edge of eye. Anterior nostrils with tubes.

Head naked. Body with rather large ctenoid scales; breast anterior to ventrals naked.

Dorsals separate; the spines when depressed not reaching insertion of soft dorsal; rays higher than the spines, not touching base of caudal when depressed. Anal inserted below base of third or fourth dorsal ray; the depressed rays reaching as far posteriorly as do those of the dorsal. Caudal acutely rounded. Pectoral pointed; the upper edge with 1 or 2 filamentous rays. Ventrals free from body posteriorly.

Color in spirits light olive, with 4 or 5 broad, indistinctly outlined, vertical, dusky bars on body; a transverse bar on nape; anterior part of head dusky. Spinous dorsal with 2 broad, blackish, oblique bands; soft dorsal dusky, with longitudinal rows of indistinct dusky spots; caudal very dark, with light spots in vertical rows; pectorals somewhat lighter, though similarly marked; anal dusky; ventrals white.

Here described from 3 specimens from the bay of Tokyo, the only definite locality yet known for the species, the earlier specimens being from uncertain collections. Günther states that it is "probably from China," while Steindachner assigns it to "Celebes or the Philippines." (*Barbatus*, bearded.)

Measurements of Tricnopogon barbatus.

Length in millimeters.....	89	98	65
Depth expressed in hundredths of length.....	27	25	22
Depth of caudal peduncle.....	14	14	14
Length of head.....	33	36	22
Length of snout.....	9½	10½	9
Width of interorbital space.....	6	7	7
Diameter of orbit.....	5	5	5
Distance from snout to spinous dorsal.....	42	42	41
Distance from snout to soft dorsal.....	62	61	61
Height of longest dorsal spines.....	13½	14	14
Height of longest dorsal rays.....	16	15½	17
Distance from snout to anal fin.....	67	66	68
Height of longest anal rays.....	15½	15½	15½
Length of caudal peduncle.....	21½	22	23
Length of caudal fin.....	21½	23	24
Length of pectoral fin.....	26½	25	25
Length of ventral fin.....	21½	21	20
Number of dorsal spines.....	6	6	6
Number of dorsal rays.....	11	11	12
Number of anal rays.....	10	10	11
Number of scales in lateral series.....	36	33	33
Number of scales in transverse series.....	14	15	15

26. TRIDENTIGER GILL.

Tridentiger GILL, Ann. Lyc. Nat. Hist. N. Y., 1858, Dec. (*obscurus*).

Triacnophorus GILL, Ann. Lyc. Nat. Hist. N. Y., 1859, p. 17 (*trigonocephalus*; name preoccupied by *Triacnophorus* Rudolphi, a genus of worms).

Triacnophorichthys GILL, Proc. Ac. Nat. Sci. Phila., 1859, p. 195 (*trigonocephalus*).

Trifissus JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372 (*ioturus*).

Body robust, little compressed, covered with moderate or rather large ctenoid scales; head broad, little depressed above, the eyes well

separate, the cheeks tumid, scaleless; mouth moderate, oblique, the lower jaw rather prominent; teeth rather large, fixed, in about 2 rows, those in the outer row trifold, the middle cusp the longer; inner series of smaller, pointed teeth; tongue rounded at tip; no barbels; gill openings restricted to the side, the gill openings very broad. Dorsals short, the first of 6 slender spines, the second of 10 to 12 rays; caudal rounded; pectoral rounded, some of the upper rays short, none of them silky. Ventrals rather long, formed as in *Gobius*, not adnate to the belly.

Rivers of China and Japan. Robust species, allied to *Otenogobius*, but with the teeth trifold. We follow Steindachner in identifying *Trienophorichthys* with *Tridentiger*. *Trifissus* is also unworthy of separation. This genus has no especial affinity to *Sicydium*.

(*Tres*, three; *dens*, tooth; *gero*, bear.)

Tridentiger.

a. Body olive green, with faint cross bands but no lengthwise stripes; scales less than 50.

b. Scales 34–16; D. VI–12; head $3\frac{1}{2}$ in length; depth $4\frac{1}{2}$; cheeks moderately tumid; head with pale spots; pectoral with a dark spot and pale bar at base *obscurus*. 48.

bb. Scales 48–15; D. VI–13; head $3\frac{1}{4}$ in length; depth $6\frac{1}{5}$; cheeks excessively swollen; head with pale spots; a pale band on pectoral at base. *bucco*. 49.

Trifissus.

aa. Body olive green, with 2 black lengthwise bands; D. VI–13; scales 54–16; head $3\frac{2}{5}$ in length; body $4\frac{1}{3}$; cheeks little tumid *bifasciatus*. 50.

48. TRIDENTIGER OBSCURUS (Schlegel).

Sicydium obscurum SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 145, pl. LXXVI, fig. 1, Nagasaki.

Tridentiger obscurus GILL, Ann. Lyc. Nat. Hist. N. Y., 1858, Shimoda.—GÜNTHER, Cat. Fish., III, 1861, p. 566; after Schlegel.—STEINDACHNER, Ichth. Beitr., VIII, 1879, p. 29.

Trienophorichthys squamistrigatus HILGENDORF, Sitzber. Naturf. Freunde, 1879, III, Tokyo; No. 10647, Mus. Berl.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 372, Yokohama; Coll. Otaki.

Tridentiger squamistrigatus STEINDACHNER, Ichth. Beitr., VIII, 1879, p. 31, Japan.

Head $3\frac{1}{2}$ in length; depth $4\frac{1}{2}$; depth of caudal peduncle $2\frac{1}{3}$ in head; eye $5\frac{1}{2}$; snout $3\frac{1}{3}$; D. VI–12; A. 11; P. 20; scales in lateral series 34, in transverse series 16.

Head large and broad, the cheek muscles not so greatly developed as in *T. bucco*. Snout blunt; the jaws equal; mouth oblique. Maxillary reaching a vertical passing between pupil and anterior edge of orbit. Teeth in 2 series, those of the outer series in 2 closely apposed rows, the teeth alternating in position, flat, trilobed, except 2 or 3 posterior ones on each side of jaw; teeth of inner row small, simple, curved backward. Tongue broad, rounded anteriorly. Gill opening not extending far forward; the isthmus broad, its width equal to distance from pupil to tip of snout. Inner edge of shoulder girdle with

a narrow, elevated ridge; but no papillæ. Gill-rakers 3 + 12, rather short and blunt.

Head naked, without barbels; anterior nostril with a high tube. Body with large, ctenoid scales; those anterior to dorsal and pectorals and on belly small and smooth; those on breast anterior to ventrals minute, embedded in the skin.

Dorsals separate; the spines long and filamentous, those of the females much shorter. Anal inserted below third or fourth dorsal ray, when depressed extending as far posteriorly as the dorsal, neither quite reaching the caudal. Caudal fin rounded. Pectoral without filaments on its upper border. Ventrals of moderate size; free posteriorly.

Color dark; head with a few small, faint light spots; body with narrow, light, lateral bands, which are more distinct posteriorly; dorsals dusky; with subdued darker markings; the first spine or ray of each fin with 4 sharply outlined black dots; soft dorsal and anal narrowly edged with white; interradial membranes of caudal dark; pectoral with a vertical white band near its base, and a dark spot at upper edge of base. The band of pectoral is bright orange in life.

In some specimens the snout is broader, the cheek muscles more puffed out, the eye a little smaller, and the maxillary slightly shorter than in others. Those from some localities are a little lighter in color than the one described. They have definite, small, round, white spots on the lower parts of the cheeks; the longitudinal bars on the body are more distinct and the spot at upper part of base of pectoral is more conspicuous.

Triacnophorichthys squamistrigatus of Hilgendorf is believed to be identical with *Sicydium obscurum* of Schlegel. The series of specimens examined by us agree with the descriptions of both species referred to above, except in the covering of the breast. Hilgendorf's statement that the breast is naked is probably due to an oversight, as the region anterior to the ventrals is covered with small, deeply embedded scales. The species is represented in our collection by specimens from Nagasaki on the south to Tokyo on the north.

The present description is taken from an individual from Enoshima. Our specimens are from Tsuruga, Aomori, Matsushima, Kawatana, Kobe, Kurume, Nagasaki, Misaki, Wakanoura, Same, Enoshima, Niigata, Tone River, Ise, and from Ishikawa-ken.

The species is very abundant in the river mouths and estuaries throughout the southern islands of Japan. It is called *Torahaze* or Tiger goby.

(*Obscurus*, dusky.)

Measurements of Tridentiger obscurus.

	Ishika- waken.		Naga- saki, Hi- zen.
Length in millimeters.....	80	66	55
Depth expressed in hundredths of length.....	26	21	24
Depth of caudal peduncle.....	13	13	12½
Length of head.....	30	30	31
Length of snout.....	10	9	11
Width of interorbital space.....	4½	4½	4½
Diameter of orbit.....	4	5½	5
Distance from snout to spinous dorsal.....	41	42	40
Distance from snout to soft dorsal.....	61	60	60
Height of longest dorsal spines.....	23	18½	28
Height of longest dorsal rays.....	16½	14	16
Distance from snout to anal fin.....	65	66	65
Height of longest anal rays.....	15	14	14
Length of caudal peduncle.....	22	24	22
Length of caudal fin.....	21½	22	22
Length of pectoral fin.....	23½	25	24
Length of ventral fin.....	16	16	18
Number of dorsal spines.....	6	6	6
Number of dorsal rays.....	11	12	12
Number of anal rays.....	11	11	11
Number of pectoral rays.....	20	21	20
Number of scales in lateral series.....	34	37	33
Number of scales in transverse series.....	15	16	17

49. **TRIDENTIGER BUCCO** Jordan and Snyder, new species.

Head $3\frac{1}{4}$ in length; depth $5\frac{1}{5}$; depth of caudal peduncle 7; eye 7 in head; snout $4\frac{1}{3}$; maxillary $2\frac{1}{4}$; D. VI-13; A. 11; P. 20; scales in lateral series 48, in transverse series 15.

Body rather robust, not tapering much toward the tail; caudal peduncle almost as deep as body, compressed. Head broad and depressed; its depth contained $1\frac{2}{3}$ times in its width; cheek muscles enormously developed, puffed out on either side beyond contour of body; top of head flat; interorbital space broad, the distance between eyes $2\frac{1}{2}$ times their diameter. Snout rounded. Eyes very small, directed laterally; anterior in position. Mouth oblique; jaws equal; maxillary reaching a vertical, passing a little beyond eye; entirely concealed by the lip and suborbital. Tongue broad, round anteriorly. Teeth in 2 series on the anterior part of jaws; the outer ones in a single row, trilobed, except 2 or 3 posterior ones, which are simple; the middle lobe high and rounded, the lateral lobes short and sharp; inner series of lower jaw in 3 rows; simple, slender, sharp, and curved backward; inner series of upper jaw in a single row, similar to those in the corresponding position below; no canines. Gill opening extending a little below base of pectoral; width of isthmus equal to space between eyes. Shoulder girdle with a narrow ridge on inner edge; no papillæ. Gill-rakers on first arch 3 + 8; short and pointed.

Head naked; no barbels or conspicuous rows of mucous pores. Anterior nostril with a thin-walled tube. Body covered with large, weakly ctenoid scales, except a small naked space beneath ventrals.

Dorsals separate, the membrane of the spinous dorsal attached to the base of the first ray; spines slender and flexible; the third longest;

the 5 anterior ones evenly spaced; the distance between the last 2 about twice that of the others; rays of soft dorsal growing successively longer toward posterior end of fin; the last rays when depressed just reaching bases of upper caudal rays. Anal inserted below base of third dorsal ray; the first ray short; the others successively longer to the fourth, which is about twice as long as the first; the fin when depressed not reaching so far posteriorly as does the dorsal. Caudal rounded. Pectoral round, extending almost to a vertical through posterior end of base of spinous dorsal; the upper edge without filamentous rays. Ventrals free from body posteriorly; their tips reaching a point halfway between base of fin and insertion of anal.

Color in alcohol pale olive gray; sides of body with 6 or 7 narrow, dark, lateral cross-bands, the upper and lower of which are indistinct; on the anterior half of body all but 2 of the bands fade out and disappear; head dark, covered with small, closely crowded, light spots.

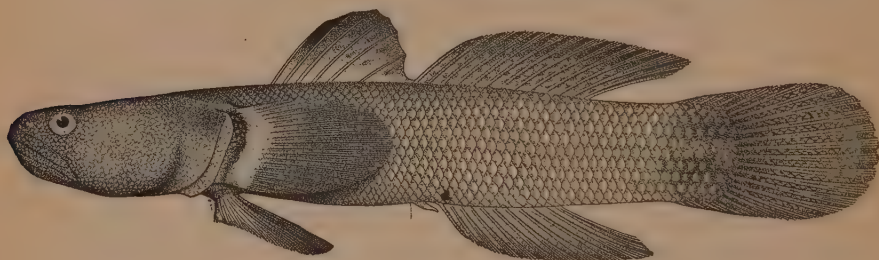


FIG. 24.—TRIDENTIGER BUCCO.

Dorsals and anal edged with black; the color more intense in the region of the first and second dorsal spines; soft dorsal with an indistinct, narrow, dusky horizontal band near the middle. Caudal dusky; black spots on interradi al membranes. Pectorals and ventrals dusky; the former with a light, vertical band at base.

Description of type No. 6459, Leland Stanford Junior University Museum. Locality, Misaki, Japan. We also have specimens from Tokyo.

Some other specimens from the type locality are a little lighter or darker in color; some have the small caudal spots arranged in more or less distinct wavy, vertical lines; others have the soft dorsal and anal narrowly edged with lighter color.

T. bucco is closely related to *T. obscurus*. It is easily distinguished by its larger mouth, broader head, smaller eye, and smaller scales; the latter species has about 36 scales in a lateral series.

(*Bucco*, thick-cheeked.)

Measurements of *Tridentiger bucco*.

Length in millimeters.....	78	74	75	69	67	67	72	70	70
Depth expressed in hundredths of length <i>a</i>	18	18	17	19	20	20	20	19	19
Depth of caudal peduncle.....	14	14	14	14	14	15	14	14	14
Length of head.....	29	29	29	30	29	30	30	30	30
Length of snout.....	8	8	7½	8	8	7½	8½	8	8
Width of interorbital space.....	6½	7	6½	6	7	6½	7	7	7
Diameter of orbit.....	4½	4	4	4	4	4½	4½	4	4
Distance from snout to spinous dorsal.....	37	37	36½	39	40	39	39	38	38
Distance from snout to soft dorsal.....	57	57	56½	58	57	59	59	57	58
Height of longest dorsal spines.....	15	15	14	16	16	18	16	11	11½
Height of longest dorsal rays.....	17	15	14½	16	15	15	17	14	14½
Distance from snout to anal fin.....	63	60	61	62	63	63	62½	65	62
Height of longest anal rays.....	15	14	15	15	13	15½	15	18	14
Length of caudal peduncle.....	25	23	22	21½	22½	23½	24½	23	23
Length of caudal fin.....	22	22	22	24	21	22	22	22	22
Length of pectoral fin.....	22	26	24	24	23	25	24	24	24
Length of ventral fin.....	16	17	16½	16½	17	17	18	17	16½
Number of dorsal spines.....	6	6	6	6	6	6	6	6	6
Number of dorsal rays.....	13	13	13	13	13	13	13	13	13
Number of anal rays.....	11	11	11	11	11	11	11	11	11
Number of pectoral rays.....	19	19	19	19	19	19	20	19	20
Number of scales in lateral series.....	48	53	48	48	49	48	50	49	52
Number of scales in transverse series.....	15	15	15	15	16	16	17	17	17

a The measurements of the depth in this case are only approximate, the abdomen having shrunk in preservation.

50. TRIDENTIGER BIFASCIATUS Steindachner.

SHIMAHAZE (STRIPED GOBY).

Tridentiger bifasciatus STEINDACHNER, Ichth. Beitr., X, p. 12 (190), Bay of Strielok, Japan Sea, near Vladivostock. Coll. Professor Dybowski, based on adult specimens without black caudal spot.

*Trifissus ioturus*¹ JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 373, Bay of Tokyo. Coll. K. Kishinouye; type No. 49403 U. S. Nat. Mus.; co-type No. 6270, L. S. Jr. Mus.; based on young specimens.

Head 3¼; depth 5; D. VI-13; A. 11; P. 19; scales 54-16. Eye 7½ in head (less in young specimens); interorbital space 3½ (the bony

¹ The following is the description of Japanese specimens (*T. ioturus*), which we are unable to separate from *T. bifasciatus*, except by characters subject to change with age:

TRIFISSUS IOTURUS Jordan and Snyder.

Description.—Head 3½ in length; depth 4½; depth of caudal peduncle 6½; eye 4 in head; snout 4½; interorbital space, bony ridge, 7 to 8 (fleshy part 3½ to 4); height of longest dorsal spine, 7 in length, ray 7; longest anal ray 7½; length of pectorals 3½; ventrals 4½; caudal 4½; dorsal VI-13; anal 12; scales in lateral series 54, in transverse series 16, between origin of soft dorsal and anal.

Head wide and flat, its width contained 1½ times in its length; interorbital space convex. Snout blunt. Mouth slightly oblique; jaws equal; premaxillary extending to a vertical through anterior edge of pupil; lips thick. Upper jaw with a row of 18 long, flat, trilobed, movable teeth, behind which is a row of small, sharp, simple teeth; lower jaw with 20 trilobed teeth, followed by a narrow band of simple, sharp, curved ones; each side of lower jaw with a small, curved canine scarcely larger than the other teeth. Gill-rakers short, pointed. Body covered with small, ctenoid scales, large posteriorly, smaller anteriorly, extending forward on nape and top of head to within a short distance—about the diameter of pupil—of the edge of orbits; other parts of head naked; without barbels. Dorsal fins not connected; third spine longest; others gradually shorter; rays, except first and last, of about the same length. First ray of anal short, simple; others gradually longer. Soft dorsal and anal projecting an equal distance posteriorly. Caudal rounded.

ridge 7 to 8); snout $4\frac{1}{3}$; breadth of head $1\frac{1}{3}$; height 2. Body moderately compressed. Head very broad, *Cottus*-like, flattish above; eyes small; interorbital broad; pectorals without silky rays. Snout decurved. Teeth in the outer row trifold, well separated from the inner row of smaller pointed teeth, hindmost tooth sometimes a little larger. Cleft of mouth broader than long, its breadth half length of head; maxillary reaching to posterior margin of eye. Head naked; nape with small scales. Scales on body moderate, ctenoid.

Color olivaceous, a broad black band on each side beginning at the forehead and extending along below the dorsals to the caudal; a second band much narrower along middle of side from base of pectoral to

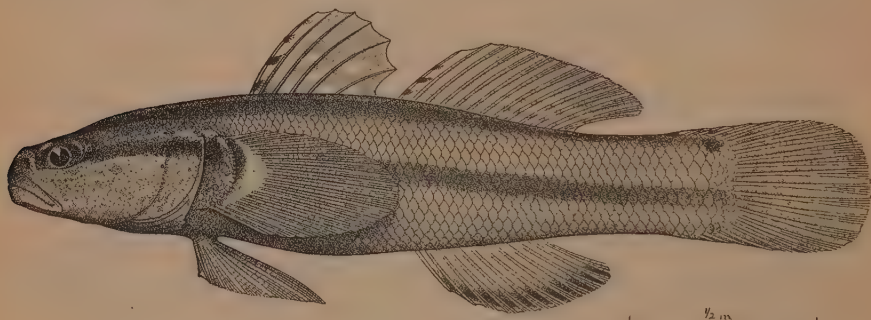


FIG. 25.—TRIDENTIGER BIFASCIATUS.

caudal; a blackish cross streak on bases of upper pectoral rays. Black streaks along near upper edge of first dorsal and front of second dorsal and along anterior rays of anal; caudal with numerous streaks of blue-gray specks; scales with dark points. Length 110 mm.

Steindachner's description, above condensed, was taken from specimens from the Bay of Strielok, near Vladivostock.

Pectoral somewhat pointed, extending posteriorly as far as tip of depressed dorsal. Ventrals not adherent to belly; their length equal to distance from center of pupil to edge of opercle. A dark color band, equal in width to vertical diameter of pupil, extending from upper edge of eye, along base of dorsal fins to the caudal, where it ends in a distinct, dark spot; a similar band running from tip of snout, through eye, upper edge of base of pectoral and along side of body to a little below middle of base of caudal; an indistinct dark spot on lower part of base of caudal; sides of head with small, light spots; first spine and first ray of dorsal fins with three distinct dark dots; the color extending posteriorly to the membrane; similar spots faintly outlined on the other spines and rays; the membranes with minute, dark dots; edges of fins a little dusky. Anal, with a dark band along the edge. Caudal, with indistinct cross-bars of bluish spots. Base of pectoral with a white band with a dusky spot before it.

Type.—No. 49403, U.S.N.M.

Locality.—Bay of Tokyo, Japan. Collector, K. Kishinouye. Japanese name, *Shimahaze* (striped goby).

Besides the type, one other specimen (cotype, No. 6270, Leland Stanford Junior University Museum) was collected. It is a little smaller and has somewhat brighter colors than the type, but differs from it in no other important way.

(ἰῶτα, jot; οὐρά, tail)

We have specimens from Tokyo Bay and from Nagasaki, the first named young, types of *T. ioturus*.

(*Bi*, two; *fasciatus*, banded.)

27. ASTRABE Jordan and Snyder, new genus.

Astrabe, new genus (*lactisella*).

Body thick-set; caudal peduncle deep. Teeth in both jaws simple; no canines; no teeth on vomer. Gill openings not extending far forward; the isthmus broad; 2 low, papillæ-like elevations on inner edge of shoulder girdle. Head naked; the skin conspicuously wrinkled and folded; body with small embedded scales on posterior parts, extending on sides almost to base of pectoral; other parts naked. Dorsals separate; 3 spines, 11 rays. Anal with 10 rays. Spines and rays of the 3 fins enveloped in thick skin. Upper rays of pectoral simple, free at tips. Ventral rays I, 5; the fins united; free from the body posteriorly. Color black, conspicuously marked with white. A single species from the rock pools of Japan. Its relations are evidently with *Luciogobius*, *Clariger* being intermediate.

(ἀστράβη, a saddle.)

51. ASTRABE LACTISELLA Jordan and Snyder, new species.

Head 3 in length; depth $4\frac{1}{2}$; D. III-11; A. 10; P. 24.

Body short, robust; depth of caudal peduncle $2\frac{1}{2}$ in head. Head depressed, broad posteriorly, its width equal to depth of body. Snout 4 in head, broadly rounded when viewed from above. Nostrils with high rims. Eyes small, perfect; interorbital space 3 in head. Jaws subequal, the lower slightly projecting; maxillary not greatly prolonged, extending to a vertical through posterior edge of orbit. Lips pendulous. Teeth on both jaws simple; no canines; no teeth on vomer. Gill opening extending upward as far as does the base of the pectoral, not running far forward below; the isthmus wide. Inner edge of shoulder girdle with 2 small elevations.

Skin thick, considerably wrinkled and folded on head, a V-shaped ridge extending from the interorbital space toward the upper edge of gill openings; a low crest above the eye; a preorbital fold running downward parallel with the maxillary, a branch passing backward below the eye well on to the cheek; snout and interorbital area conspicuously wrinkled; lower jaw with a low median fold, a larger one on either side, the anterior part of which is cut off, forming a small pendant flap; a third fold, the edge of which has bead-like elevations lying between the latter and the lower lip; branchiostegal area with small folds.

Dorsal fins separate; the longest spine contained about 3 times in head; soft dorsal free from caudal; when depressed not quite reaching base of latter; the rays slightly longer than the spines of first

dorsal. Anal inserted below base of second dorsal ray; when depressed it extends a little farther posteriorly than does the dorsal. Dorsals and anal covered with thick skin, making the determination of the number of rays difficult. Caudal rounded. Pectoral similar in shape, extending to a vertical midway between tip of ventrals and the anal opening; of 24 or 25 rays, the upper 6 of which are detached and simple. Ventrals rays 1, 5; the fins united; the disk elevated anteriorly; free from body posteriorly.

Head and anterior parts of body naked; small, thin, embedded scales on posterior parts, the scales growing forward on a V-shaped area almost to base of pectoral. Lateral line indicated anteriorly by a series of 9 or 10 groups of little pores, 3 or 4 pores arranged vertically in each group.

Color blue black; a broad, white band passing over back part of head and anterior region of body, including basal third of pectoral fin; another narrower and shorter band between the dorsals, encroaching

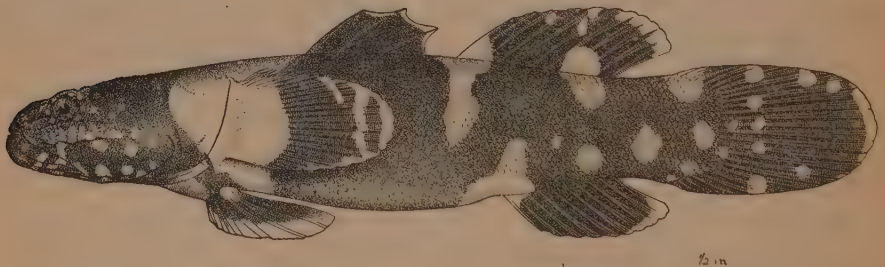


FIG. 26.—*ASTRABE LACTISELLA*.

on base of soft dorsal; a third passing over the ventral surface at insertion of anal, its ends in the central region of the body being near those of the dorsal-band just mentioned; several large and small white spots on body and on the unpaired fins posterior to the bands; throat white; cheeks and chin with white specks; pectorals spotted with white near the tips; ventral disk bordered with white.

The general form of the body and the peculiarly wrinkled and folded skin of the head reminds one of the blind goby of Point Loma, *Typhlogobius californiensis*.

Type No. 6460, Leland Stanford Junior University Museum.

The single known specimen was taken in August, 1900, at the rock pools near Misaki, in Sagami.

(*Lac*, *lactis*, milk; *sella*, saddle.)

28. *CLARIGER* Jordan and Snyder, new genus.

Clariger JORDAN and SNYDER, new genus (*cosmurus*).

This genus has the form and general appearance of *Luciogobius*, differing in the presence of a short spinous dorsal of three slender

spines. The body is elongate, the head broad and flattened, and the skin with a few cycloid scales on the tail. Below the eye are a few short filaments or barbels.

Japan.

(*Clarus*, clear; *gero*, to bear, from the white back.)

52. CLARIGER COSMURUS Jordan and Snyder, new species.

Head $3\frac{1}{4}$ in length; depth $7\frac{3}{4}$; depth of caudal peduncle 10; eye $7\frac{3}{4}$ in head; snout 5; D. III-12; A. 12; P. 18.

Body not sloping much from its deepest part toward caudal peduncle; cylindrical anteriorly; caudal peduncle greatly compressed. Head elongate; broad; flat on top. Snout long; pointed; lower jaw projecting. Maxillary extending beyond eye. Mouth almost horizontal. Tongue broad, notched anteriorly. Teeth simple, in narrow bands on both jaws; lower jaw with a small canine on each side. Eyes directed obliquely upward; the space between them about equal to their diameter. Gill openings not extending far forward. No papillae



FIG. 27.—CLARIGER COSMURUS.

on inner edge of shoulder girdle. No barbels on jaw. A row of slender barbels extending along suborbital area from snout to a point a little beyond eye.

Head naked; a row of rather large, round, cycloid scales on median part of caudal peduncle. Dorsals separate, the first of 3 slender spines; soft dorsal with fleshy membrane. Anal inserted below first dorsal ray. Caudal round. Pectorals acutely rounded. Ventrals free posteriorly from body.

Color white; a broad, chocolate-colored lateral band, with irregular borders, extending from tip of snout to base of caudal fin; the band narrow on snout, gradually widening to the posterior end; at base of caudal the white encroaches on the band from above and below, nearly dividing it, and causing it to spread out in a fan-shaped figure almost entirely covering the fin, the solid color broken up into dots and vertical bands on posterior part of fin.

The species is known from a single specimen, 37 millimeters long, secured at Misaki, Sagami. Type 6461, Leland Stanford Junior University Museum.

(*κοσμέω*, to adorn; *οὐρά*, tail.)

29. EUTÆNIICHTHYS Jordan and Snyder, new genus.

Eutæniichthys new genus (*gilli*).

Body elongate, compressed, with rudimentary, embedded, rather small, cycloid scales. Head short; mouth small, oblique, the chin not prominent; teeth simple; isthmus broad; no barbels; dorsal rays III, 17; anal 12, the soft dorsal much larger than the anal, and beginning far in front of it. Ventrals well developed. Caudal pointed.

Japan.

(*Eutænia*, a garter snake; *εὖ*, well; *ταῖνια*, ribbon; *ἰχθύς*, fish.

53. EUTÆNIICHTHYS GILLI Jordan and Snyder, new species.

Head $6\frac{1}{2}$ in length; depth 11; depth of caudal peduncle 3 in head; eye $4\frac{1}{2}$; D. III-18; A. 11.

Body very long and slender. Snout blunt, about equal in length to diameter of eye; jaws equal. Eyes directed obliquely upward; interorbital space narrow. Mouth oblique, cleft reaching a vertical

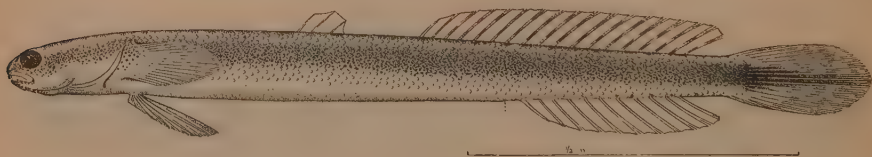


FIG. 28.—EUTÆNIICHTHYS GILLI.

through anterior edge of pupil. Teeth simple, curved, in 2 or 3 rows on each jaw; no canines. Gill openings not extending far forward below; the isthmus broad. No papillæ on inner edge of shoulder girdle. No barbels on head.

Head naked; body with rather small, round, cycloid, scattered scales.

Dorsals separate, the spinous dorsal far in advance of soft dorsal; spines short, slender; soft dorsal, when depressed, not quite reaching caudal. Anal inserted below anterior third of dorsal, extending as far posteriorly as does the dorsal. Caudal acutely rounded. Pectoral pointed, the upper edge without free filaments. Ventrals long, free posteriorly.

Color in spirits yellowish white; a broad band of brownish and blackish dots extending along sides throughout the entire length, the color on caudal fin darker than that of body; median dorsal region with brown dots grouped together, forming spots of irregular outline.

The species is easily recognized by its short spinous dorsal and very slender body. Known only from four specimens about 35 mm. long, collected by Dr. K. Kishinouye in the Tone River, near Tokyo. Type No. 6462, Leland Stanford Junior University Museum.

(Named for Dr. Theodore Gill, in recognition of his studies of Japanese gobies.)

30. LUCIOGOBIUS GILL.

Luciogobius GILL, Proc. Ac. Nat. Sci. Phila., 1859, p. 146 (*guttatus*).

Body elongate, moderately compressed, the skin naked. Head long and low, depressed above, with tumid cheeks; mouth rather large, terminal, oblique, the chin prominent; teeth pointed; no barbels; tongue notched; gill openings narrow, not extending forward below, separated by a broad isthmus. Spinous dorsal wanting. Soft dorsal rather short, opposite the short anal; caudal short, rounded, remote from dorsal and anal; pectorals rather large, without silk-like rays; ventrals very short, the rays indistinct, the two fins united in a rounded disk. Color dusky.

One species known, a small goby of the muddy shores of Japan, resembling *Zoarcids* in appearance, but evidently belonging to the same family with the other gobies.

(*Lucius*, pike; *Gobius*, goby.)

54. LUCIOGOBIUS GUTTATUS GILL.

Luciogobius guttatus GILL, Proc. Ac. Nat. Sci. Phila., 1859, p. 146 (Shimoda; Coll. J. MORROW).—GÜNTHER, Cat. Fish., III, 1861, p. 152; after Gill.

Luciogobius guttatus STEINDACHNER, Ichth. Beitr., VIII, 1879, p. 26, Yokohama.

Head $4\frac{1}{2}$ in length; depth $6\frac{1}{2}$; depth of caudal peduncle $9\frac{1}{2}$; eye $8\frac{1}{2}$ in head; snout $4\frac{1}{2}$; D. 13; A. 12; P. 17.

Body cylindrical anteriorly; caudal peduncle not much compressed. Head broad and depressed; the cheek muscles greatly developed, bulging outward and upward, making a deep concavity on top of head. Eyes small, directed obliquely upward; interorbital space concave, the eyes projecting somewhat above its floor. Snout rather pointed, its length contained about 3 times in postorbital part of head; lower jaw projecting. Mouth almost horizontal; the cleft wide, extending to a vertical passing just behind orbit. Teeth minute, in narrow bands on both jaws; no canines. Tongue broad, forked at tip. Gill openings narrow, extending upward but little above middle of base of pectoral; the isthmus very broad, its width about equal to depth of caudal peduncle. Inner edge of shoulder girdle without protuberances. Gill-rakers on first arch represented by slight elevations only.

Head and body naked; skin of snout wrinkled; lips pendulous; anterior nostril with a short tube. No barbels.

Spinous dorsal absent. The skin in the region which is occupied by the fin in other gobies has a peculiar folded structure, shaped somewhat like a feather, a median elevated ridge, with smaller radiating ridges on either side; the latter extending posteriorly along the base of soft dorsal. Soft dorsal inserted directly above first ray of anal; the distance between tip of snout and insertion of dorsal about equal to 3 times length of head; depressed fin falling far short of base of

caudal; anal lower than dorsal; the height of rays about 2 times the diameter of eye; membranes of both dorsal and anal fleshy. Caudal rounded posteriorly. Pectoral rounded, the upper edge without filamentous rays. Ventral disk small, broad, free posteriorly.

Color in spirits light yellowish olive; upper parts darkened by a close stippling of blue-black, the points growing larger and farther apart on the ventral surface; dorsal parts and sides of head and body with small, round spots of the light body color. Dorsal fin with about



FIG. 29.—*LUCIOGOBIUS GUTTATUS*.

4 longitudinal rows of indistinct, small dark spots on the rays. Caudal with vertical, wavy, dark bands, broader than the light interspaces. Anal white, except a very narrow dusky area at base. Pectoral dusky. Ventrals without dark color.

A small species found living in little sandy pools under rocks at low



FIG. 30.—*LUCIOGOBIUS GUTTATUS* (elongate example).

tide; the specimens here described found among stones on one of the old artificial islands in the bay of Tokyo. We also have very numerous specimens from Hakodate, Wakanoura, Same, and a very small one from Nagasaki. In the rock pools of Hakodate Head they are especially abundant. The species varies widely in depth of body and in breadth of the head. We are unable, however, to recognize more than one species in the genus.

(*Guttatus*, spotted.)

Measurements of Luciogobius guttatus.

Length in millimeters.	47	51	46	51
Depth expressed in hundredths of length ...	15	14 $\frac{1}{2}$	14 $\frac{1}{2}$	15 $\frac{1}{2}$
Depth of caudal peduncle	9 $\frac{1}{2}$	9	10	9 $\frac{1}{2}$
Length of head	24	22	25	24
Length of snout	6	5	6	6
Width of interorbital space <i>a</i>	6	6	7	7
Diameter of orbit	3	3 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{1}{2}$
Distance from snout to dorsal	65	65	66	66
Height of longest dorsal rays	5	5	5 $\frac{1}{2}$	8 $\frac{1}{2}$
Distance from snout to anal	65	65	66 $\frac{1}{2}$	65
Height of longest anal rays	5	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6 $\frac{1}{2}$
Length of caudal peduncle	18	19	18	17 $\frac{1}{2}$
Length of caudal fin	14 $\frac{1}{2}$	14	14	15
Length of pectoral fin	15	14	14 $\frac{1}{2}$	14
Length of ventral fin	5	5	6	5
Number of dorsal rays	12	12	12	12
Number of anal rays	12	12	12	12
Number of pectoral rays	17	16	17	16

a Distance between eyes.

31. LEUCOPSARION Hilgendorf.

Leucopsarion HILGENDORF, Berliner Monatsber., 1880, p. 339 (*petersi*).

Body elongate, compressed, scaleless, the substance translucent; head short, depressed above; the cheeks little tumid; the eyes prominent; mouth rather large, terminal, oblique; teeth simple, no barbels; tongue notched; isthmus narrow, the gill openings continued forward below. Spinous dorsal wanting; soft dorsal moderate, well separated from the short caudal; anal longer than the soft dorsal and inserted well in advance of the latter; pectorals rather long; ventrals very small, fully united, forming a rounded scale-shaped disk, the rays obscure; the structure seems exactly as in *Gobius*, but the fin much less developed.

Small translucent fishes of the estuaries of Japan, evidently closely allied to *Luciogobius* and related to the true gobies. One species known.

(λευκός, white; ὀψάριον, a little fish.)

55. LEUCOPSARION PETERSI Hilgendorf.

SHIRO-UWO (WHITE FISH): HIO.

Leucopsarion petersi HILGENDORF, Berliner Monatsber., 1880, p. 340, April 5, Southern Japan.

Head 5 $\frac{1}{2}$ in length; depth 7 $\frac{1}{2}$; depth of caudal peduncle 12 $\frac{3}{4}$; eye 4 in head; snout 3 $\frac{1}{2}$; maxillary 2 $\frac{1}{2}$; D. 13; A. 17; P. 15.

Body long, slender, considerably compressed; caudal peduncle notably long. Head long, not so deep or broad as body; snout rather blunt, the lower jaw projecting. Eyes small, directed laterally; interorbital space convex, the distance between eyes equal to length of snout. Mouth oblique; maxillary extending to a point below middle of pupil. Teeth simple, long, slightly curved backward, in a single row on each jaw; no canines. Gill opening broad, extending very far forward; the isthmus narrow. No papillæ on inner edge of shoulder girdle. Gill-rakers long and slender. No barbels on head.

Head and body naked. Skin along median part of back anterior to dorsal, with a peculiar feather-shaped structure; a median elevation with short, oblique, lateral branches.

Dorsal extending a little farther posteriorly than the anal. Caudal slightly notched, the lobes rounded. Anal inserted much in advance of dorsal. Pectoral rounded, without detached rays on upper edge. Ventrals short, free from body posteriorly.

Color in life translucent, in spirits yellowish white; lips with minute brownish dots; occiput with a few small spots of same color; median

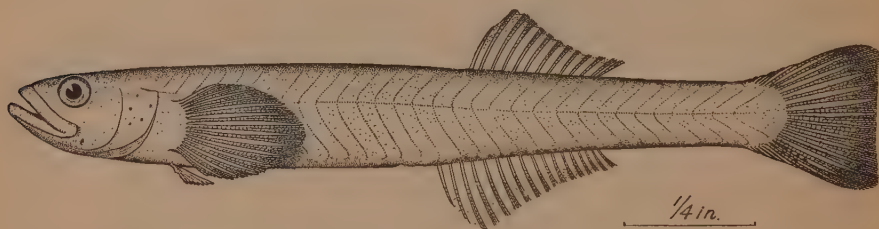


FIG. 31.—*LEUCOPSARION PETERSI*,

dorsal area with small dots; a brownish black line on throat and anterior half of belly. Some specimens have the color less intense than have others, the small spots on occiput often being absent.

Described from numerous specimens collected at Niigata, in Echigo, presented by Dr. C. Ishihawa. We also have representatives from Hiroshima. It was not seen elsewhere by us. (Named for Dr. W. Peters, of the University of Berlin.)

Measurements of Leucopsarion petersi.

Length in millimeters.....	39	36	36
Depth expressed in hundredths of length.....	13	13	14
Depth of caudal peduncle.....	8	7½	8½
Length of head.....	21	20	21
Length of snout.....	6	5½	5½
Width of interorbital space.....	4	5	5
Diameter of orbit.....	4	5	5
Distance from snout to soft dorsal.....	51	61	60
Height of longest dorsal rays.....	10	11	6
Distance from snout to anal fin.....	55	55	54
Height of longest anal rays.....	12	11	7
Length of caudal peduncle.....	21	21	21
Length of caudal fin.....	14	15	15
Length of pectoral fin.....	14	17	14
Length of ventral fin.....	7	6	17
Number of dorsal rays.....	13	13	13
Number of anal rays.....	17	17	17

32. *TRYPACHEN* Cuvier and Valenciennes.

Trypauchen CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, p. 152 (*vagina*).

Body elongate, compressed, covered with minute cycloid scales; head short, compressed, bluntly rounded in profile; mouth rather small, terminal, oblique, the thick lower jaw very prominent; teeth moderate, in bands; tongue inconspicuous, not notched; no barbels; gill openings confined to the side, the isthmus very broad; eyes very

small, but distinct, the interorbital space elevated; a pit above the opercle, opening into a cavity which is separate from the gill cavity. Dorsal fin continuous, very long and low, of 6 short spines and 40 to 50 soft rays; soft dorsal and anal continuous with the pointed caudal; pectoral fins small; ventral fins very small, I, 4, more or less fully united, but usually notched at tip. Vertebrae $10 + 24 = 34$.

East Indies, north to Japan. Slender, eel-shaped gobies, remarkable for the cavity above the opercle.

(τρύπη, hole; ἀυχήν, nape.)

56. **TRYPAUCHEN WAKÆ** Jordan and Snyder, new species.

Trypauchen vagina STEINDACHNER, Reise Schiff Aurora, 1898, p. 220, Kobe (not of Schneider).

Head $6\frac{2}{5}$ in length; depth $8\frac{3}{4}$; eye $11\frac{1}{2}$ in head; interorbital space $6\frac{3}{4}$; snout 4; maxillary 3; D. VI, 52; A. 46; scales in lateral series 55, in transverse series about 12.

Body very long; greatly compressed. Head short, as wide and deep as body; its dorsal part, posterior to eyes, with a sharp, bony crest. Eyes very small, directed obliquely forward; interorbital area convex;

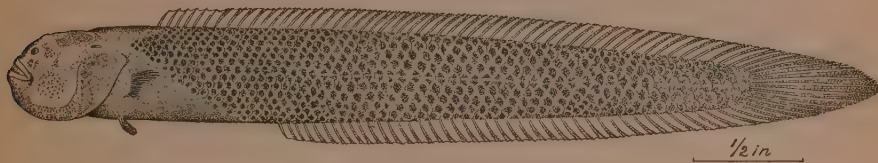


FIG. 32.—TRYPAUCHEN WAKÆ.

space between the eyes about equal to twice their diameter. Snout short, blunt; lower jaw projecting beyond the upper. Mouth oblique. Maxillary concealed, extending to a vertical through anterior edge of orbit. Teeth in 2 rows, simple, the outer ones enlarged; no canines. Gill opening not extending far forward; the isthmus broad, its width contained about 3 times in head. No papillæ on inner edge of shoulder girdle. Gill-rakers reduced to mere elevations on the arch. Anterior nostrils with distinct tubes. Deep pit at upper edge of opercle, about as long as eye. No barbels.

Head naked; the skin with many mucous pores. Body with small, thin, round, cycloid scales; nape to front of dorsal and breast to beyond tip of pectoral and ventral naked; belly nearly back to vent naked, or with a few scattered scales.

Dorsals connected; the spines short and strong; the rays slightly longer than the spines; anal rays as high as those of dorsal; both dorsal and anal connected with caudal. Caudal pointed. Pectoral acutely rounded above; the lower rays shortened, its upper edge without free filaments; its length $3\frac{1}{2}$ in head. Ventrals very small, 5 in head, free posteriorly; the tip of the united fin notched.

Color in spirits bluish brown.

Type No. 6515, Leland Stanford Junior University Museum.

Wakanoura, Kii.

The species is close to *Trypanchen vagina* of India, but the pectorals and ventrals are much shorter than in the latter species. According to Cuvier's description and Day's figure, the naked area on front of trunk is much smaller, and the figure shows a more elongate mouth and head.

Inland sea of Japan in sandy bays. We have specimens from Wakanoura, Owari Bay, and Kobe.

(*Waka-no-ura*, bay of Waka, or romantic song.)

33. TÆNIOIDES Lacépède.

Teniodes LACÉPÈDE, Hist. Nat. Poiss., II, 1798, p. 580 (*herrmannianus*).

Amblyopus CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, 1837, p. 157 (*herrmannianus*).

Odontamblyopus BLEEKER, Archives Néerl., IX, 1874, p. 330 (*rubicundus*).

Body elongate, compressed, eel-shaped, naked or with very rudimentary scales. Head oblong quadrilateral, flattish above. Mouth almost vertical, the lower jaw prominent, thick, its cleft directed upward; maxillary not produced backward; tongue not notched. Teeth slender, in a band, the outer ones, especially below, very long and curved. Eyes minute, hidden. Gill openings confined to the sides; the isthmus broad. Dorsal fin very long, the anterior part of 5 or 6 slender, wide-set spines, more or less distinct; the soft dorsal of 30 to 50 rays; soft dorsal and anal continuous with the slender, pointed caudal; pectoral fins short; ventral fins long, I, 5, completely united, not adnate to the belly; no pseudobranchiae. Vertebrae 11 + 17 = 28.

Estuaries of Japan, China, and southward; several species known. Distinguished from the American genus *Gobioides* by the much larger number of dorsal and anal rays. (D. VI, 16 in *Gobioides*.)

(*ταβία*, ribbon; *εἶδος*, resemblance.)

57. TÆNIOIDES LACEPEDEI (Schlegel).

Amblyopus lacepedei SCHLEGEL, Fauna Japonica, Poiss., 1848, p. 146, pl. LXXV, fig. 2.

Bay of Omura, near Nagasaki.

Head $7\frac{1}{2}$ in length; depth 17; depth of caudal peduncle 4 in head; maxillary 3; D. VI, 46; A. 44.

Body extremely elongate, compressed. Head long, rounded anteriorly. Mouth almost vertical, the lower jaw projecting beyond the upper. Maxillary concealed, not extending far back. Eyes small; covered by the skin. Teeth in 2 series; an inner narrow band of villiform teeth, and an outer row of large, loosely attached, fang-like teeth. Tongue rounded anteriorly. Gill opening restricted to the sides; the isthmus broad. No papillae on inner edge of shoulder girdle. Gill-

rakers very short and blunt. No pseudobranchiæ. Anterior nostrils with small tubes. Symphysis of lower jaw with a pair of short, slender barbels. Skin much wrinkled on snout and lower jaw.

Head and body naked. Lateral line represented by a series of about 27 groups of minute pores, each group arranged in vertical lines.

Dorsal continuous; 6 slender spines; 46 rays; anal of about 44 rays; dorsal and anal continuous with the caudal; the membranes tumid. Caudal pointed. Pectoral very small, contained about 3 times in

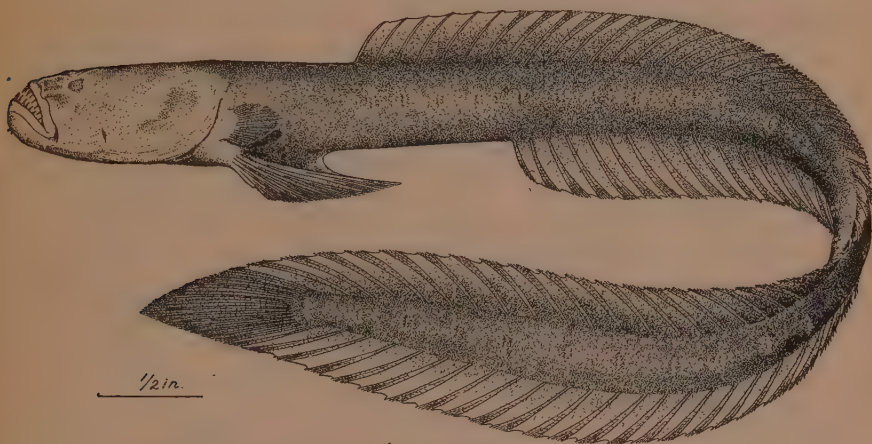


FIG. 33.—*TENIOIDES LACEPEDEI*.

head; acutely rounded; the upper edge without free filaments. Ventrals large; about equal to length of head; free posteriorly; the anterior half connected to the body by a flexible fold of skin.

Color in spirits bluish brown.

Its slender body, long dorsal and anal, concealed eyes, and other peculiar characters make it easy to recognize among Japanese gobies.

Southern Japan, in sandy bays; apparently not common. Our specimens were obtained at Wakanoura. It is called *Warasubo*, or straw-eel. (Named for Bernard Germain Étienne de la Ville-sur-Ilлон, Comte de La Cépède.)

RECAPITULATION.

List of the species of Gobiidæ known to be found in Japan, with localities from which we have specimens. Species marked * are here described for the first time.

1. *Vireosa* Jordan and Snyder.

1. * *hanæ* Jordan and Snyder.

Misaki, Sagami.

2. *Asterropteryx* Rüppell.

2. * *abax* Jordan and Snyder.

Misaki.

3. *Valenciennesa* Bleeker.

3. *muralis* (Quoy and Gaimard).

4. *Odontobutis* Bleeker.
Tokyo; Kurume, Chikugo; Lake Biwa (Funaki); Kawatana.
5. *Eleotris* Schneider.
5. *fusca* (Schneider).
6. *oxycephala* (Schlegel).
Yokohama; Wakanoura, Kii; Lake Biwa.
6. *Boleophthalmus* Cuvier and Valenciennes.
7. *chinensis* (Osbeck).
Nagasaki; Tokyo.
7. *Periophthalmus* Schneider.
8. *cantonensis* (Osbeck).
Tokyo.
8. *Hazeus* Jordan and Snyder.
9. * *otakii* Jordan and Snyder.
Nagasaki.
9. *Goonus* Linnæus.
10. * *pæciliichthys* Jordan and Snyder.
Misaki.
10. *Ctenogobius* Gill.
11. * *abei* Jordan and Snyder.
Wakanoura.
12. *similis* (Gill).
Nagasaki; Kurume; L. Biwa, Matsubara; Kaga; Kana R., Yamashiro; Tsushima; Ishikawa-ken; Kawatana, Hizen; Iyo, Shikoku.
13. *gymnauchen* (Bleeker).
Misaki; Wakanoura; Nagasaki; Tokyo Bay; Tsuruga; Enoshima, Sagami.
14. * *hadropterus* Jordan and Snyder.
Nagasaki; Kurume; Tsuruga; Kawatana.
15. * *campbelli* Jordan and Snyder.
Wakanoura.
16. * *virgatulus* Jordan and Snyder.
Misaki; Wakanoura; Nagasaki; Tokyo Bay; Matsushima; Onomichi; Semida R., near Tokyo.
17. *pflaumi* (Bleeker).
Yokohama; Wakanoura; Tsuruga, Echizen; Aomori, Rikuoku; Matsushima; Rikuzen; Onomichi, Bingo; Kobe, Settsu; Owari Bay; Kawatana.
11. *Abomu* Jordan and Starks.
18. *lactipes* (Hilgendorf).
Matsushima; Aomori; Tokyo; Tsuruga; Enoshima; Tone R., near Tokyo.
19. *tsushimæ* Jordan and Snyder.
Tsushima.
20. *heptacantha* (Hilgendorf).
21. *breunigi* (Steindachner).
22. *urotænia* (Hilgendorf).
12. *Cryptocentrus* Ehrenberg.
23. *filifer* (Cuvier and Valenciennes).
Onomichi; Nagasaki; Wakanoura; Tokyo; Kobe; Tsuruga.

13. *Glossogobius* Gill.
24. *brunneus* (Schlegel).
Hakodate; Onomichi; Kurume; Nagasaki; Wakanoura.
14. *Chænogobius* Gill.
25. *annularis* Gill.
26. *macrognathos* (Bleeker).
Funaki, Omi; Kurume; Aomori; Tokyo; Tsuruga; Chitose; Matsubara; Same;
Gifu, Mino; Nagoya, Owari; Kawatana.
15. *Chloea* Jordan and Snyder.
27. *castanea* (O'Shaughnessy).
Nagasaki; Misaki; Matsushima; Aomori; Tsuruga; Niigata, Echigo.
28. *lævis* Steindachner.
29. * *mororana* Jordan and Snyder.
Mororan, Hokkaido; Tokyo, Matsushima.
30. * *sarchymnis* Jordan and Snyder.
Wakanoura.
16. *Chasmias* Jordan and Snyder.
31. *dolichognathus* (Hilgendorf).
Misaki; Wakanoura; Nagasaki; Tsuruga; Matsushima; Enoshima; Hakodate,
Hokkaido; Same, Rikuoku.
32. *misakius* Jordan and Snyder.
Misaki; Nagasaki; Enoshima; Hakodate; Tsushima.
17. *Pterogobius* Gill.
33. *virgo* (Schlegel).
Miyajima; Uraga, Sagami.
34. *elapoides* (Günther).
Hakodate; Matsushima; Aomori; Utatsu, Noto.
35. * *daimio* Jordan and Snyder.
Misaki; Wakanoura.
36. * *zacalles* Jordan and Snyder.
Misaki.
37. * *zonoleucus* Jordan and Snyder.
Misaki.
18. *Suruga* Jordan and Snyder.
38. * *fundicola* Jordan and Snyder.
Suruga Bay; Matsushima; Sagami; Owari Bay.
19. *Acanthogobius* Gill.
39. *flavimanus* (Schlegel).
Hakodate; Onomichi; Kurume; Nagasaki; Wakanoura; Misaki; Matsushima,
Aomori; Tokyo; Tsuruga; Enoshima; Niigata; Yodo R., Osaka.
20. *Sagamia* Jordan and Snyder.
40. * *russula* Jordan and Snyder.
Nagasaki; Misaki; Wakanoura.
21. *Synechogobius* Gill.
41. *hasta* (Schlegel).
22. *Parachaturichthys* Bleeker.
42. *polynemus* Bleeker.
Tsuruga; Kobe; Nagasaki; Wakanoura; Hiroshima; Onomichi.

23. *Chaeturichthys* Richardson.
43. *stigmatias* Richardson.
Sasuna, Tsushima.
44. *hexanemus* (Bleeker).
Nagasaki; Tsuruga; Owari Bay; Aomori; Tokyo; Matsushima; Mororan,
Hakodate.
45. * *sciistius* Jordan and Snyder.
Tsuruga; Owari Bay; Aomori; Tokyo; Matsushima; Mororan; Hakodate.
24. *Ainosus* Jordan and Snyder.
46. *geneionemus* (Hilgendorf).
Misaki.
25. *Triænopogon* Bleeker.
47. *barbatus* Günther.
Tokyo.
26. *Tridentiger* Gill.
48. *obscurus* (Schlegel).
Tsuruga; Aomori; Matsushima; Kawatana; Kobe; Kurume; Nagasaki; Misaki;
Wakanoura; Same; Enoshima; Niigata; Tone R.; Ise; Ishikawa-ken.
49. * *bucco* Jordan and Snyder.
Misaki; Tokyo.
50. *bifasciatus* Steindachner.
Tokyo; Nagasaki.
27. *Astrabe* Jordan and Snyder.
51. * *lactisella* Jordan and Snyder.
Misaki.
28. *Clariger* Jordan and Snyder.
52. * *cosmurus* Jordan and Snyder.
Misaki.
29. *Eulænichthys* Jordan and Snyder.
53. * *gilli* Jordan and Snyder.
Tone R., near Tokyo.
30. *Luciogobius* Gill.
54. *guttatus* Gill.
Tokyo; Hakodate; Nagasaki; Wakanoura; Same, in Rikuoku.
31. *Leucopsarion* Hilgendorf.
55. *petersi* Hilgendorf.
Niigata; Hiroshima.
32. *Trypauchen* Cuvier and Valenciennes.
56. * *wakæ* Jordan and Snyder.
Owari Bay; Kobe; Wakanoura.
33. *Teniodes* Lacépède.
57. *lucepedei* (Schlegel).
Wakanoura.

A FLIGHTLESS AUK, MANCALLA CALIFORNIENSIS, FROM THE MIOCENE OF CALIFORNIA.

By FREDERIC A. LUCAS,
Acting Curator of Vertebrate Fossils.

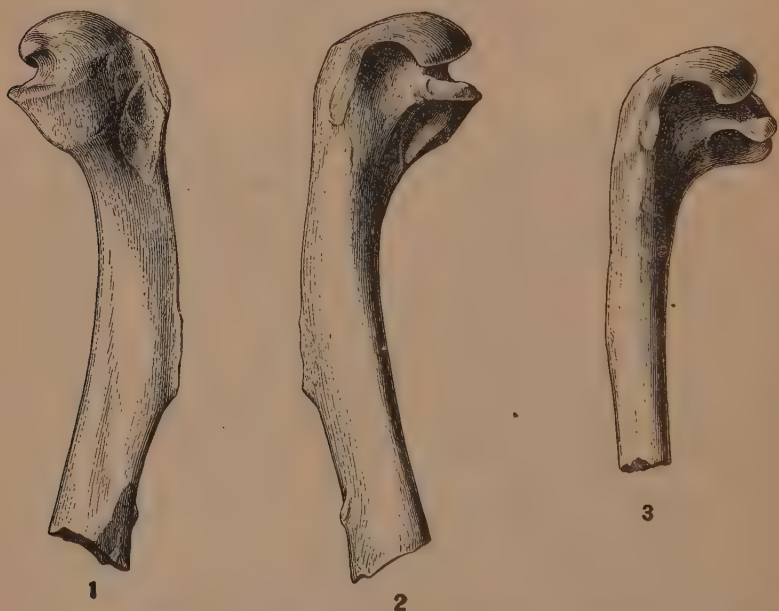
The name *Mancalla californiensis* is proposed for a fossil flightless auk, represented by a nearly complete left humerus found in excavating Third street tunnel at Los Angeles, California, in strata considered by Mr. W. H. Dall as belonging to the Upper Miocene or Lower Pliocene, probably the former. The type is No. 4976 in the catalogue of fossil vertebrates, U. S. National Museum. The genus is characterized by a short flattened humerus, devoid of the customary sigmoid flexure, by the moving of the articular head of the humerus toward the ulnar border, and by the development of the ridge for the attachment of the brachialis inferior muscle. Total length of specimen 68 mm.

That the bird was flightless is shown at once by the shortness and flatness of the humerus, and further by the fact that the bone lacks the slightly sigmoid shape characteristic of the humeri of flying birds, being instead slightly concave on the ulnar border. Absence of the power of flight is also shown by the moving of the articular head of the humerus toward the ulnar side, as in birds which fly well the articular face is well toward the radial border. In the penguins this face is as far down on the ulnar border as the lowest point of the inferior crest, and in the flightless Great Auk the articular surface is nearer the ulnar border than in any other member of the auk family save the one under consideration. The inferior crest is stout and well developed, and incloses a large subtrochanteric fossa. This is pierced for an artery, and so is the corresponding fossa of the Great Auk, while no such perforation is present in the specimens of *Lomvia*, *Alca*, or *Lunda* examined.

The humerus has a larger medullary cavity than has the corresponding bone of the Great Auk, and it is interesting to recall that the leg bones of *Hesperonis*, the most highly specialized of aquatic birds,

were also hollow, and probably filled with marrow. In the penguins the leg bones are filled with cancellar tissue.

The bird to which this humerus belonged was more highly specialized, more completely adapted for subaquatic flight, than the Great Auk, although the wings were not so extremely modified as those of the penguins. This is probably due to the fact that the penguins swim solely with their wings, while the auks use both wings and feet. The occurrence of a flightless auk at so low a geological horizon as the Miocene is of great interest, as indicating a much earlier origin for the family. From the greater degree of specialization of the wings, it is



FIGS. 1 AND 2.—SUPERIOR AND INFERIOR VIEWS OF TYPE SPECIMEN OF *MANCALLA CALIFORNIENSIS*.

FIG. 3.—CORRESPONDING PORTION OF LEFT HUMERUS OF *LOMIVIA TROILE CALIFORNICA*, ALL SLIGHTLY ENLARGED.

fair to infer that the body of *Mancalla* was larger in proportion to the size of the humerus than that of the Great Auk, and that hence the actual bulk of the two was not greatly dissimilar. *Mancalla* was certainly larger than any of the murre, although its nearest living relative appears to be the Pacific Murre, *Lomvia troile californica*.

In small birds absence of the power of flight implies freedom from enemies, and as this practically means isolation, it is probable that this flightless auk bred on some islands near the coast. The mollusk fauna associated with the specimen is Miocene in its aspect, and also indicates a cooler climate than that now prevailing in the latitude of Los Angeles, approximately that of Puget Sound.

AN ANNOTATED LIST OF MAMMALS COLLECTED IN THE VICINITY OF LA GUAIRA, VENEZUELA.

By WIRT ROBINSON,

Captain, U. S. Army,

and

MARCUS WARD LYON, Jr.,

Aid, Division of Mammals.

During the summer of 1900 the authors spent six weeks collecting in the vicinity of La Guaira, Venezuela. The present paper embodies the results of the trip so far as mammals are concerned; the birds, reptiles, and batrachians are treated in the two succeeding articles in this volume.

La Guaira, the seaport town of the Venezuelan capital, Caracas, lies along the foot of a range of lofty mountains. This range breaks away from the eastern chain of the Andes in Colombia, bears northeast until it reaches the coast of the Caribbean Sea near Puerto Cabello, thence hugs the shore in an almost due east direction, and finally ends opposite the island of Trinidad. For the greater part of this latter course the slopes fall precipitately into the sea, the waves of the Caribbean breaking against the foot of the mountains themselves, but in places there is a littoral strip or terrace of no great width.

The mountains immediately behind La Guaira reach a height of 8,000 feet, but from this point fall away gradually as one proceeds to the eastward. There are in the vicinity of La Guaira few or no passes through these mountains. Seven miles to the west there is a rugged gap, high up on the side of which winds the English railroad to Caracas. To the eastward there are no near-by breaks in the chain.

Upon these peaks there is constant precipitation, and frequent streams of fine water furrow ravines in their course to the sea. The channels of these streams are well wooded, and would afford good ground for the collector were they not rendered so difficult by their cramped canyon-like character, their precipitous descent, and their boulder-strewn beds. The few trails that exist avoid these streams and zigzag up the crests of the more practicable slopes.

This northern coast of Venezuela is noted for its heat. The tropical sun beats upon it without mercy, and where water fails the aspect of the country is that of a desert. The littoral plain near La Guaira, where not watered by the *acequias*, or irrigation trenches, which bring the water from high up on the courses of the mountain streams, is parched and dusty, and given over to Agaves, Cacti of various kinds (*Opuntia*, *Cereus*, *Melocactus*), and to a sage-brush-like plant (*Lantana*) of characteristic odor. But wherever water can be obtained the plain assumes a most fertile and flourishing character. Such is the condition at Macuto, three miles east of La Guaira. Still farther to the east, some seven miles from La Guaira, a large stream comes down a fair-sized valley. Before debouching upon the plain, its water is all carried off to the right and left by the *acequias*, and used to operate sugar mills and afterwards to irrigate wide fields of cane.

In what might be called the delta of these two *acequias* lies the little straggling village of Caraballeda, and a short distance up in the mouth of the valley itself are some dozen scattered huts, the group bearing the name of San Julián.

Immediately back of the littoral plain there rises to about 500 feet a first row of red-clay foothills of the same character of vegetation as the plain. Behind these foothills, and springing almost from their tops, rise the mountains proper, and these latter are more or less well wooded, but are too steep and rough to afford collecting ground. On their southern aspect these mountains appear to be wooded only in the folds, while the ridges are covered with coarse grasses.

The western slopes of the San Julián Valley, although precipitous, have been cleared where it was possible for the peons to climb, and have been planted with coffee; but as the coffee plants require shade, fruit trees of several kinds have been set out, so that the hills may still be said to be wooded. About three miles up the valley the virgin forest is encountered.

Owing to several causes of uncertainty the trip could not be decided upon until the last minute, and less than a week was available for preparation. As a consequence there were some deficiencies in the outfit, notably in the number of Schuyler rat killers, the trap which was found to be by far the most useful.

Sailing from New York on June 21, the writers reached La Guaira on the morning of July 1.

Ten days spent in collecting in the vicinity resulted in but slight success, owing partly to a week's delay in getting guns through the custom-house, partly to the apparent scarcity of mammalian life, and partly to the prevailing drought and to poor luck at trapping. Fortunately a portion of the outfit was a cane gun, which escaped the notice of the customs officials, and with which a number of bats and small birds were secured.

On July 6 Captain Robinson made a reconnoissance along the railroad to Caracas in search of better collecting ground, but saw only one place that looked at all promising, a station called Cucurutí, about halfway up the road. He spent a half day here on July 7, but was unable to arrange for food or shelter.

On July 11 he made a second reconnoissance, this time to San Julián, and finding that the ground was favorable and that he could secure a vacant hut, he moved there on July 13 and remained until August 10. Mr. Lyon joined him on July 16, but was compelled by illness to return to La Guaira on July 22. He shortly after moved to Macuto, where he collected until August 10, in the meantime making one excursion for bats to a cave near Peña de Mora, on the La Guaira and Caracas Railroad, 9 miles below Caracas and at an elevation of 2,295 feet.

The return steamer to New York was taken on August 13.

In submitting these notes the writers wish to express their indebtedness to Mr. Gerrit S. Miller, jr., for much advice on technical points; to Dr. J. A. Allen, of New York City, Mr. Witmer Stone, of Philadelphia, and Mr. Outram Bangs, of Boston, for the examination of South American material in their possession; and to Mr. Oldfield Thomas, who compared several specimens with types in the British Museum.

Owing to his connection with the U. S. National Museum and facilities for comparisons and references, the descriptions of new species and the technical parts of this paper are entirely the work of the junior author, while the field notes have been almost exclusively compiled by Captain Robinson.

Where specimens are listed by numbers in the following pages it should be observed that those specimens preceded by the letters "W. R." are in Captain Robinson's collection,¹ while specimens unpreceded by letters belong to the Museum collection. Measurements of specimens are in millimeters unless otherwise stated.

1. DIDELPHIS KARKINOPHAGA Zimmermann.

FLESH-EATING OPOSSUM.

Local name: Rabo Pelado, i. e., skinned, or hairless tail.

1897. *Didelphis karkinophaga* ALLEN and CHAPMAN, Bull. Amer. Mus. Nat. Hist., IX, p. 23.

1900. *Didelphis karkinophaga* BANGS, Proc. New Eng. Zool. Club, I, p. 89.

Represented by five specimens, an adult female and four young. This was the first mammal trapped, and all were taken in rat killers baited with bananas. They are very tenacious of life, none being killed by the traps.

¹ During the course of printing this paper Captain Robinson has generously presented a large number of his specimens to the U. S. National Museum.

The adult and two of the young possess long black hairs scantily overlying the under-fur. One of the young has these black hairs replaced by white, and in another most of the black hairs are so replaced. The tail is eminently prehensile. Measurements of the adult female: Length, 700; tail, 350; hind foot, 50.

2. CALUROMYS PHILANDER (Linnaeus).

WOOLLY OPOSSUM.

Local name: Comadreja, a misnomer, as the word is Spanish for weasel.

1888. *Didelphys philander* THOMAS, Cat. Marsupialia and Monotremata, Brit. Mus., p. 337.

1894. *Didelphys (Philander) philander* THOMAS, Ann. Mag. Nat. Hist., 6th ser., XIII, p. 439.

1900. *Caluromys philander* ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 189.

One adult female and three young collected by Captain Robinson at San Julián. The tail is uniformly brown in color, as in *C. trinitatis* (Thomas) instead of having the terminal portion white, which is said to be typical of specimens from Guiana. Its skull measures a trifle less than that of the female given by Mr. Thomas in his Catalogue of the Marsupialia. In the following measurements the figures in parentheses are those given by Mr. Thomas. Skull: Basal length, 44 (48); greatest breadth, 28.5 (31); nasals. length, 20 (21.5); maximum breadth, 7 (6.8); minimum breadth, 3.5 (3.3); postorbital processes, tip to tip, 15.5 (16); intertemporal constriction, 9.8 (9.5); palate, length, 25 (28); breadth outside m^3 , 15 (16.5); inside m^3 , 10.5 (11.5); length molars 1-3, 7 (8).

Dimensions of female collected at San Julián, August 1: Length, 517; tail, 307; hind foot, 38.

One is struck at once by the difference in aspect between this and the common opossum; its rounded head, much more rounded than is usually represented in cuts; its large, mild, yellowish-brown eyes, so different from the beady black eyes of the other species; its woolly fur with no coarse hair, and its very long and slender prehensile tail. The young cling to their mothers' wool by their tails, mouths, hands, and feet, and the strength of their grasp is remarkable. The pouch of the female is lined with orange-brown hair and contains six rather prominent mammæ.

3. PERAMYS BREVICAUDATUS (Erxleben).

SHORT-TAILED PIGMY OPOSSUM.

Local name: Ratón Casiragua.

1888. *Didelphys brevicaudata* THOMAS, Cat. Marsupialia and Monotremata, Brit. Mus., p. 356.

Only one specimen of this interesting little animal was secured, a young female trapped at San Julián on August 7. It was taken in a thicket of vines near a stream, in a cyclone trap baited with rolled oats. Its tail is not prehensile. The specimen was identified by Mr. Oldfield Thomas. It measures as follows: Length, 144; tail, 55; hind foot, 17.

4. CABASSOUS LUGUBRIS (Gray).

NAKED-TAILED ARMADILLO.

Local name: Cachicamo.

1873. *Ziphipha lugubris* GRAY, Hand-List of the Edentate, Thick-skinned, and Ruminant Mammals in the British Museum, p. 23.

1899. *Tatoua (Ziphipha) lugubris* MILLER, Proc. Biol. Soc. Wash., XIII, p. 6.

1900. *Cabassous hispidus* BANGS, Proc. New Eng. Zool. Club, I, p. 89.

One specimen, a young male, was obtained by Captain Robinson at San Julián on July 11. Its measurements were: Length, 498; tail, 192; hind foot, 73.

It was kept alive until the following day. When put down near water it waded in and drank freely by rapidly protruding and retracting its slender tongue. This was 8 mm. wide at the widest point, and could be extended 60 mm. beyond the tip of the nose. There were fleshy filaments in the nostrils pointing to the front, and probably serving the purpose of the hairs in the nostrils of other animals. Its gait was very awkward; it stepped on the tips of the large claws of its forefeet and turned in its hind feet with the waddle of a muskrat. Its testes were abdominal. Its penis was recurved and turned to the left, so that in urinating a fine stream was ejected backward between its hind legs and to the left of its tail. This is probably a result of its burrowing habits. Its excrements were rounded and very hard, consisting apparently of earthy and gritty matter taken in along with its food. It made no attempt to roll up when molested, but if grasped around the middle would press forcibly against one's fingers with its heavy foreclaws.

5. TAYASSU TAJACU (Linnæus).

BRAZILIAN COLLARED PECCARY.

Local name: Báguira.

1889. *Dicotyles tajacu* COPE, Amer. Naturalist, XXIII, pp. 146-147.

1897. *Dicotyles tajacu* ALLEN and CHAPMAN, Bull. Amer. Mus. Nat. Hist., IX, p. 22.

Represented by one living specimen purchased in the market at La Guaira and now in the National Zoological Park, Washington, D. C. It may be *T. torvus* Bangs,¹ but this can not be determined without an examination of its skull. At San Julián Captain Robinson saw the hides of four that had been killed the previous year by the dogs of one of the natives. Some years ago small bands of six or eight came frequently to the clearings, but now they are not so abundant.

¹Proc. Biol. Soc. Wash., XII, 1898, p. 164.

6. PROECHIMYS GUAIRÆ Thomas.

LA GUAIRA SPINY RAT.

1901. *Proechimys guairæ* THOMAS, Proc. Biol. Soc. Wash., XIV, p. 27.

Mr. Oldfield Thomas kindly described this rat from specimens submitted to him. In his description he says that it is closely related to *Proechimys minckleyi* Allen, from the Santa Marta region of Colombia. As he had no specimens from that locality with which to make the actual comparison, the following comparison made with topotypes of *P. minckleyi* in the American Museum of Natural History will be of interest in proving the distinctness of the Venezuelan species.

Proechimys minckleyi is much brighter in coloration throughout, the bright ochraceous color of the hairs is retained all over the upper parts, sides, legs, and cheeks. In *P. guairæ* the back alone is a rather dull ochraceous which bleaches out along the sides, legs, and cheeks so that viewed from the side *P. guairæ* is clay color instead of the ochraceous seen in *P. minckleyi*. The tail of *P. guairæ* is slightly lighter above, has slightly longer hairs, a few of which are whitish in color, while the hairs on the dorsal surface of the tail in *P. minckleyi* are invariably dark. The skulls are quite similar, but in *P. guairæ* the anterior palatine foramina are much wider than they are in *P. minckleyi*, and the outer edges more concave and scooped out. The condyloid process of the mandible in *P. guairæ* is wider by from 1 to 2 millimeters than it is in *P. minckleyi*, and the distance between the coronoid process and the condyle is greater than the corresponding distance in the Santa Marta animal.

Six were taken around the edges of a small clearing about two miles up the ravine east of La Guaira. All were caught in rat-killers baited with bananas and set under boulders on the precipitous hill-sides. Three were taken in a similar locality at San Julián. An adult female taken at San Julián on July 17 had 6 mammae, 2 inguinal and 4 latero-pectoral. These last 4 are readily overlooked, as they are not at all on the under surface of the animal, but well up on the flanks among the coarse hair of the upper parts. The skin of these rats is of extreme tenderness, especially around the root of the tail and the back of the neck, tearing at the slightest touch.

Measurements.

No.	Locality.	Date.	Sex.	Length.	Tail.	Foot.
WR 1476	La Guaira	July 8	Male	455	203	52
¹ 102731	do	do	do	430	190	48
WR 1484	do	July 9	Female	387	180	47
102732	do	July 11	Male	209	No tail.	48
102733	do	July 12	Female	361	148	45
² 102734	do	July 13	Male			
WR 1509	San Julián	July 17	Female	435	210	50
WR 1516	do	do	Male	450	195	51
WR 1633	do	Aug. 4	Young male	351	170	46

¹ Type.² Presented to British Museum.

7. COELOGENYS PACA (Linnæus).

SPOTTED CAVY.

*Local name: Lapa.*1893. *Coelogenys paca* ALLEN and CHAPMAN, Bull. Amer. Mus. Nat. Hist., V, p. 228.1900. *Coelogenys paca* BANGS, Proc. New Eng. Zool. Club, I, p. 99.

Two specimens badly mutilated by dogs and machetes were secured from the natives at San Julián. They were adult males. These are thickset animals of the general proportions of a guinea pig and extremely heavy for their size. Their eyes are nearer the frontal plane than usually represented in figures. The tail is a mere stub with a callous tip. The skin is composed of several layers. The outer, which is brown on the upper parts and white beneath, is of extreme tenderness and tears even under the edge of a keen knife. The under layer is thick and fibrous and cuts like wet surgeon's cotton. It clings so tightly to the flesh that it must be dissected free. Any attempt to remove the hide by pulling results in splits in the tender outer skin, showing the white fibrous layer beneath.

On each side of the anus there is a large oval gland protruding farther to the rear than the tail and resembling a testis. These glands measure 30 by 20 mm. Horizontally across the middle runs a cleft, and if the gland be pressed at the top and bottom, it opens along this cleft and becomes everted like two thick, protruding lips, rolling back and revealing a somewhat nodular surface.

The sexual organs are peculiar. The testes are abdominal. The penis has on either side of the dorsum of the glans a corneous plate, hinged on the inner edge and with strong hooked thorns on the free edge. The fore part of the organ is thickly beset with recurved spines and terminates in two white, horny, conical tubes or awns, one-half inch long.

The flesh of the lapa is more highly esteemed by the natives than that of any other game, and the animals readily bring from \$2 to \$3 each in the markets.

They were formerly abundant in the forests at San Julián, and are still fairly common. At a small village 10 miles farther to the east there are two brothers who had killed over 60 lapas in the preceding twelve months.

As might be inferred from the character of the feet and hair and position of the eyes, the lapa takes freely to water when pursued and dives and swims beneath the surface with ease. They often squat with only their nostrils and eyes above the water.

Measurements.

No.	Locality.	Date.	Sex.	Length.	Tail.	Foot.
WR 1604	San Julián...	Aug. 1	Male	665	26	110
WR 1659	do.....	Aug. 8	do.....	633	22	116

8. *HETEROMYS MELANOLEUCUS* Gray.

WHITE AND BLACK POUCHED RAT.

Local name: Mochilero, i. e., one who carries a "mochila," or knapsack.

1868. *Heteromys melanoleucus* GRAY, Proc. Zool. Soc. London, p. 204.

1900. *Heteromys melanoleucus* BANGS, Proc. New Eng. Zool. Club, I, p. 98.

Three (one adult and two young) were taken at San Julián and another immature specimen at Macuto. Mr. Oldfield Thomas says of these that they are essentially topotypes. They were taken among vines and underbrush, not far from open spots covered with coarse grass. Their pouches are lined scantily with short, whitish hairs, and will contain almost a teaspoonful. It is worthy of note that a portion of the contents of the pouches of the Macuto specimen and of one of the San Julián specimens consisted of fragments of a shed skin of a snake.

Measurements of the adult female taken at San Julián August 7: Length, 282; tail, 156; hind foot, 33.

9. *SIGMODON SANCTÆMARTÆ* Bangs.

SANTA MARTA COTTON RAT.

1898. *Sigmodon sanctæmartæ* BANGS, Proc. Biol. Soc. Wash., XII, pp. 189-190.

1900. *Sigmodon sanctæmartæ* BANGS, Proc. New Eng. Zool. Club, I, p. 98.

Only one specimen, an adult male, trapped at San Julián on July 29. It was taken in a rat-killer baited with corn and set under some loose stones on the edge of a small cleared patch. Persistent trapping in the same locality for some days thereafter produced no result. Measurements: Length, 288; tail, 127; hind foot, 35.

10. *ORYZOMYS MEDIUS*, new species.

LA GUAIRA RICE MOUSE.

Type.—Young adult male, skin and skull, No. 105405, U. S. N. M. From San Julián, 8 miles east of La Guaira, Venezuela, August 8, 1900.

Characters.—Most nearly related to *Oryzomys mollipilosus* Allen and *O. magdalinae* Allen, both from the Santa Marta district of Colombia. In external size and in coloration of the skin it most nearly resembles *O. magdalinae*, but in size and shape of skull it agrees more closely with *O. mollipilosus*.

Pelage.—Soft and velvety, hairs on the back about 9 or 10 millimeters long; about half that length or a little less on the under parts.

Color.—Type: The upper parts an indefinite mixture of raw sienna and a deep blackish brown, the latter predominating on the median

dorsal area. The raw sienna is more extensive on the lateral dorsal regions and on the sides; as it approaches the belly it bleaches out to buff in color. Upper surfaces of the legs grayish. Dorsal surface of feet covered with a few short whitish hairs. Entire under parts, including region about mouth and under surfaces of legs, light gray. Fur everywhere slate color at base. Tail brownish throughout, darker above and at the tip, lighter beneath; clothed with a few fine short dark hairs about three to a scale, and in length equal to about a scale's length and a half. Ears brownish, clothed inside and out with a few short fine dark hairs, more numerous and darker externally.

An old adult nursing female has a greater predominance of the raw sienna. This color is brighter than in the type and approaches tawny ochraceous. The hairs of the under parts are much worn and almost slate gray.

Measurements.—Type: Total length, 262; tail, 138; hind foot, 31; ear from meatus (measured on the dry skin), 17. Average of four specimens, length, 260; tail, 134; hind foot, 31.

Skull.—Intermediate in size between that of *Oryzomys mollipilosus* and *O. magdalinae*, but similar in shape to that of former. The inter-orbital region is narrowed and the temporal beading well developed, as in *O. mollipilosus*, but the brain case is broader behind and the upper tooth row longer by half the last molar. Palate wider between the molars. Comparing the skull of *Oryzomys medius* with that of *O. magdalinae* it is seen to be narrower interorbitally, the beading more convergent, so that if prolonged forward the lines would meet at the posterior end of the nasals. In *O. magdalinae* they would meet at middle of nasals. The brain case of *O. medius* is more expanded, the rostrum shorter. The upper tooth rows are of the same length in each, but the teeth are wider in *O. medius* than in *O. magdalinae*.

Measurements of the type skull: Total length, 30.4; basal length, 25; zygomatic width, 14.2; mastoid width, 11; least interorbital width, 5; length of nasals, 12; palatal length, 6.4; length of palatal foramina, 4; length of upper tooth row, 4.6; greatest length of lower jaw, 17.6; depth of lower jaw at condyle, 7.2; length of lower tooth row, 5.

Oryzomys medius is based on four specimens, a fully adult female and three young adult males, measurements of which are given below. As already mentioned, it is intermediate between and at the same time entirely distinct from *O. mollipilosus* and *O. magdalinae*. The color of the old female is almost precisely the same as that of *O. magdalinae*, but *O. mollipilosus* is a lighter colored animal. In the structure of the skull, however, *O. medius* and *O. mollipilosus* are remarkably alike.

Three specimens were taken at San Julián under some vines and stones around a dead stump on the edge of a coffee plantation. They were captured in cyclone traps baited with rolled oats. A fourth specimen was taken at Macuto.

Measurements.

No.	Locality.	Date.	Sex.	Length.	Tail.	Foot.
WR 1648	San Julián..	Aug. 7	Male ..	246	128	30
WR 1654	do.....	Aug. 8	do...	262	130	32
102735	Macuto.....	Aug. 5	Female..	271	140	31
¹ 105405	San Julián..	Aug. 8	Male ..	262	138	31

¹Type.11. *MUS NORVEGICUS* Erxleben.

COMMON BROWN RAT.

Common at Macuto and at La Guaira, where they were found around the sewer openings along the beach and in the houses of the town. Two specimens from La Guaira; one from Macuto.

12. *MUS MUSCULUS* Linnæus.

HOUSE MOUSE.

Abundant. They played around the hotel floor at La Guaira in broad daylight. Several were trapped at San Julián at a considerable distance from any hut. Two specimens from La Guaira; one from San Julián.

13. *SCIURUS GRISEOGENA* (Gray).

GRAY-CHEEKED SQUIRREL.

Local name: *Ardita*.

1867. *Macrozys griseogena* GRAY; Ann. Mag. Nat. Hist. 3d ser., XX, p. 429.

Mr. Thomas says of specimens submitted to him: "The squirrel is very typical of *S. griseogena* Gray, the specimen, No. 102721, being more exactly like the type than any others of the large numbers we have here [in the British Museum]."

As this species is imperfectly known, the following description will not be out of place:

Color.—Entire upper surface of head, body, hind legs, and base of tail, and sides of body a fine grizzle of dull orange-buff and black. Bases of hairs and underfur slate color; rest of hair black to and including the tip, except two, or sometimes only one, ring about $1\frac{1}{2}$ mm. wide of dull orange-buff. A few hairs are black throughout. In some specimens the black hairs are quite abundant and the orange-buff rings reduced to very narrow bands, so that the back appears darker than in the average specimen. Under parts of body and legs, orange-rufous; upper surface of forelegs, fore and hind feet, a dull hazel or cinnamon-rufous; base of tail above and below colored as the back; the tip black. The intermediate portion above varies in individuals from bright hazel to orange-rufous, and a few specimens have some black intermixed. Outer edge of under surface of tail about

10 mm. in width, the same color as upper surface; that is, hazel or orange-rufous. This is followed by a narrow band almost black in color. The central portion of the under surface of the tail is a mixture of blackish and dull orange-buff, the latter color predominating.

Skull.—Premolars $\frac{1}{2}$, braincase somewhat elongated; highest point of skull just posterior to line of postorbital processes. Audital bullae rather small. The skulls show little individual variation, and three adults average as follows: Maximum length, 50.4; basal length, 43.3; maximum width, 29.8; interorbital constriction, 16.3; length of nasals, median line, 15.7; length of upper molar series, 9.

Sciurus griseogena very closely resembles *Sciurus aestuans hoffmanni* Peters. The general appearance of the dorsal surface of the body and limbs is more olivaceous, due to the more buffy color of the subterminal bands of the hairs. The under parts are much brighter in color, being orange-rufous instead of tawny-ochraceous or dull ferruginous as in *hoffmanni*. The coloration of the tail in *griseogena* is much redder than that of *hoffmanni* and lacks the conspicuous admixture of black seen in the Central American squirrel, the terminal reddish bands being much wider and the subterminal black bands narrower than the corresponding ones found in *hoffmanni*. The skulls resemble one another very closely and present no differences except that the premolars in *griseogena* are larger than they are in *hoffmanni*. It apparently needs no comparison with the bright colored, white-bellied squirrels of the *variabilis* type that have been collected in the Santa Marta region of Colombia.

These squirrels were abundant at San Julián and were also found at La Guaira and at Macuto. In all 27 specimens were secured. At San Julián the majority were taken in the coffee plantations where they resorted to feed on the sweet pulp in the seed pods of the various species of Guamas, one of the fruit trees planted to shade the coffee. Others were shot as they fed on aguacates, on mangoes, and on bananas. The natives stated that they do much damage to green corn.

At San Julián in the latter part of July and first of August at least a dozen were seen daily. They were rutting at this season and the males were pursuing the females. On July 24 five males were shot in a few minutes, all after the same female. At these times they bark, but the sound is low and guttural. There was not heard any chirring sound nor the shrill sneezing, characteristic of our red squirrel. They resemble this species in the readiness with which they descend to the ground and take refuge in holes in the rocks instead of hiding among the branches.

Measurements.

No.	Sex.	Length.	Tail.	Foot.	Remarks.
WR 1492	Y o u n g male.	345	170	50	
WR 1499	Male	430	208	52	Mammæ, 6.
WR 1501	Female	390	177	50	
WR 1517	Male	400	184	53	
WR 1528	Female	383	180	51	do.
WR 1529	Male	393	192	52	
WR 1546	Female	411	210	53	do.
WR 1547	do	388	187	50	do.
WR 1548	do	411	198	51	do.
WR 1555	Male	400	188	50	
WR 1556	Y o u n g male.	383	194	54	
WR 1557	Male	396	195	51	
WR 1558	do	406	192	54	
WR 1559	do	397	190	54	
WR 1564	Female	393	197	53	do.
WR 1565	Y o u n g male.	367	172	52	
WR 1596	Male	412	197	52	
WR 1630	do	386	182	50	
WR 1631	do	408	194	52	
102718	do	382	175	51	
102719	do	390	186	49	
102720	Female	396	199	51	
102721	Male				Presented to British Museum.
102722	Female	409	190	51	
102723	Young fe- male.	376	205	49	
102724	Female				do.
102725	do	395	195	49	

14. CANIS CANCRIVORUS Desmarest.

CRAB-EATING DOG.

Local name: Zorro Perro, i. e. Dog Fox, to distinguish it from other widely different animals to which the name Zorro, Fox, is applied.

1820. *Canis cancrivorus* DESMAREST, Mammalogie, p. 199.

1898. *Urocyon aquilus* BANGS, Proc. Biol. Soc. Wash., XII, pp. 93-94.

1900. *Urocyon aquilus* BANGS, Proc. New Eng. Zool. Club, I, p. 100.

In the hut of a native at San Julián there were two small fox cubs that had been caught some time in June in a cane field as the cane was being cut. They were dusky colored like the cubs of our gray fox. One died about July 20, and the other had become very tame when he was killed for catching a newly hatched chicken. On July 31 a half-grown cub was brought in by some boys whose dogs had caught and killed it. On August 3 the same boys brought in an adult male and on August 7 another half-grown cub.

The cubs are very like our gray fox of the same age, but the likeness disappears in the adult, which, although of about the same size, has a much less bushy tail, is more tawny about the flanks, and is not so grizzled.

The adult measured: Length, 940; tail, 290; hind foot, 145; height at shoulder, 400.

There is some variation in the sizes of the skull and teeth of the crab-eating dogs along the northern coast of South America, as is seen by the following table:

Measurements.

Locality.	Basal length.	Zygomatic breadth.	Maxioid breadth.	Breadth across post-orbital processes.	Breadth of palate at middle of last molar.	Length of palate.	Maximum length of single half of mandible.	Maximum length of Pm ⁴ .	Maximum length of M ¹ .	Maximum breadth of M ¹ at middle.
Santa Marta, Colombia ¹	123	64	42.8	36.8	19	61	94	14	9.8	11.6
do ²	122	74.6	48	42	22.8	63.6	104	12.2	9	10
San Julián, Venezuela	123	76	45	43	20.2	65	107	13.2	10.4	12.2
Maturín, Venezuela	122	74	45.5	37.5	21.8	65	105	13.2	9.4	10.4
British Guiana	74			36	21	65	101	14.2	9.8	12.2

¹ Bangs's collection, No. 8002.

² Type of *Urocyon aquilus* Bangs, Bangs's collection, No. 8001.

Mr. Bangs's specimens from Santa Marta have a slightly grayer color and the hind feet are rather smaller. The material is too limited to form definite conclusions on the local forms of this dog.

15. PUTORIUS AFFINIS (Gray).

SOUTH AMERICAN WEASEL.

Local name: *Hurón*, the Spanish for ferret.

1874. *Mustela affinis* GRAY, Ann. and Mag. Nat. Hist. 4th ser., XIV, p. 375.

1896. *Putorius affinis* MERRIAM, N. A. Fauna, No. 11, p. 31.

A young male was shot at San Julián as it ran over some bowlders in a ravine. Its eyes shone with the same greenish light as do the eyes of our common weasel, and it emitted the same strong odor.

The specimen, identified by Mr. Oldfield Thomas, measures: Length, 431; tail, 168; hind foot, 51.

16. DESMODUS ROTUNDUS (Geoffroy).

VAMPIRE, OR BLOOD-SUCKING BAT.

1878. *Desmodus rufus* DOBSON, Cat. Chiropt. Brit. Mus., p. 547.

1900. *Desmodus rufus* J. A. ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 87.

1900. *Desmodus rotundus* THOMAS, Ann. Mus. Civ. Stor. Nat. Genoa, 2d ser., XX, p. 2.

In the cave at Peña de Mora one specimen of this interesting bat was found in a mummified condition. It gave the following measurements: Forearm, 53; longest finger, 88; thumb with claw, 17; tibia, 23; foot, 14.

At San Julián the donkeys were bitten almost nightly by bats, but although many attempts were made to secure specimens, and rewards were offered for them, none were obtained. The donkeys were usually

bitten on the withers or just along the base of the mane, and on several occasions the blood had flowed from the wound and trickled down the forelegs as far as the knee. In almost every shed or stable there was some contrivance to frighten away the bats. Usually pieces of tin or the wings of a black vulture stuck into a fruit of a pawpaw were suspended from the roof, so as to swing just above the backs of the animals.

17. ARTIBEUS PLANIROSTRIS (Spix).

LESSER ARTIBEUS.

1878. *Artibeus planirostris* DOBSON, Cat. Chiropt. Brit. Mus., p. 515.

1897. *Artibeus planirostris* ALLEN and CHAPMAN, Bull. Amer. Mus. Nat. Hist., IX, p. 15.

1900. *Uroderma planirostris* BANGS, Proc. New Eng. Zool. Club, I, p. 101.

While this bat is smaller than the one described under the same name by Dobson, it is the one usually called *A. planirostris*, and shows no tangible differences from Brazilian examples in the Philadelphia Academy of Natural Sciences.

Three specimens were obtained at Macuto. At first sight they resemble immature specimens of the large *A. palmarum*. They, along with a couple of the larger species, were obtained by swishing the air with poles in a garden at night, at the same time attracting them by making with the tongue a clicking noise in imitation of their cry. They are preserved in alcohol and give the following measurements:

Measurements.

No.	Sex.	Length.	Forearm.	Longest finger.	Tibia.	Foot.
102894	Male.....	75	60	117	22	14
102895	Female....	73	59	121	22	15
102896	do....	70	57.4	120	21	16

18. ARTIBEUS PALMARUM Allen and Chapman.

PALM ARTIBEUS.

1897. *Artibeus palmarum* ALLEN and CHAPMAN, Bull. Amer. Mus. Nat. Hist., IX, p. 16.

1900. *Artibeus palmarum* J. A. ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 89.

Represented by 66 specimens—36 skins and 30 alcoholics.

At early dawn on July 3 a number of these large bats were seen to fly into a cocoa palm near La Guaira. When the day became sufficiently bright to see clearly they were discovered hanging from the midribs of the leaves, and six were secured. They were afterwards found abundantly in the trees in the streets and park at Macuto. They hung in clusters of from one to a dozen or more. Mr. Lyon secured 22 one morning, of which 10 were killed at one shot. Two were shot at San Julián. They evidently roost by sexes. They were often found

in the dark recesses between the trunk of the cocoa palms and the pendent clusters of nuts, but were found most frequently in dense shade trees.

They average over 21 inches in extent, and as their wings are broad they make a striking appearance when flying. When in flight, the white tips of their wings are conspicuous, although these are hardly noticeable in the dead specimens. Their eyes are prominent and light brown. There are two mammæ.

Nearly all of the females obtained were either nursing or pregnant. A female taken at La Guaira on August 11 contained a nearly mature foetus 65 mm. in length and 248 in extent. Its body, including its ears and a portion of its wings, was covered with a very fine membrane which made it appear hairless, but when this membrane dried it could be brushed away, showing the short hair beneath.

Measurements.

No.	Sex.	Length.	Fore-arm.	Longest finger.	Tibia.	Foot.
102866	Female.....	83	69	150	25	16
102867	Male.....	89	65	140	25	18
102868	Female.....	88	68	147	26	19
102869	do.....	93	68	144	25	17
102870	do.....	86	71	150	27	18
102871	do.....	88	71	148	25	16
102872	do.....	87	65	138	24	16
102873	Male.....	83	68	142	24	17
102874	Female.....	87	67	147	25	16
102875	Male.....	92	68	146	25	18
102876	do.....	86	70	148	26	17
102877	Female.....	96	70	145	26	18
102879	do.....	81	68	139	25	17
102880	do.....	80	68	141	25	18
102881	do.....	91	70	147	25	16
102882	do.....	90	69	147	25	18
102883	do.....	87	71	148	26	17
102885	do.....	90	71	150	27	18
102886	do.....	83	70	147	26	18
102892	Male.....	83	69	145	25	17

19. *VAMPYROPS HELLERI* Peters.

HELLER'S STRIPED-BACKED BAT.

1878. *Vampyrops helleri* Dobson, Cat. Chiropt. Brit. Mus., p. 524.

This species has usually been confused with *V. lineatus*, but the distinctness of the two can no longer be questioned. The present specimens agree perfectly with Dr. Peter's original description. They are much lighter in color than *V. lineatus*, and have the markings much more distinct. It is much smaller in every way, and both skins and skulls can be thus distinguished at a glance. The difference in size, however, is not so great as it is between *V. vittatus* and *V. lineatus*.

The following are the measurements of the two species, No. 8180, Bangs's collection, and No. 1543, Robinson's collection, the measurements in parentheses being those of *helleri*. Forearm, 43 (37); long-

est finger, 100 (87); tibia, 16 (13); foot, 13 (11); greatest length of skull, 27 (23); greatest width of skull, 16.2 (14).

Four females were secured at San Julián. They were found hanging together from the underside of some large plantain-like leaves in a dense and gloomy thicket at the foot of a cliff. When flushed they flew but a short distance, and on being started again they returned at once to their first roosting place. All contained fetuses almost ready for exclusion.

The interfemoral membrane extends about 6 mm. beyond the end of the spine. The mammae are two. The tragus, lobe, base and rims of the ears, and parts of the nose leaf are lemon yellow. This color fades rapidly in the dried skins.

Measurements.

No.	Sex.	Length.	Forearm.	Longest finger.	Tibia.	Foot.
WR 1541	Female...	63	38	82	13.6	10.6
WR 1542	do.....	61	35	85	13	10
WR 1543	do.....	63	37	87	13	11
WR 1544	do.....	61	35	87	14	10

20. *DERMANURA QUADRIVITTATUM* (Peters).

FOUR-STRIPED DERMANURE.

1878. *Artibeus quadrivittatus* DOBSON, Cat. Chiropt. Brit. Mus., p. 521.

1900. *Dermanura quadrivittata* BANGS, Proc. New Eng. Zool. Club I, p. 101.

Two nursing females and a young male of this species were caught under a loose scale of bark on a mango tree at San Julián on July 27. On July 31 two more were obtained in a clump of banana plants—one a nursing female, the other on the point of giving birth; and on August 3 three more were shot in a dense thicket of coffee plants—one a nursing female, one pregnant, and the third a male.

One specimen, a male, preserved in alcohol was obtained at Macuto by swishing the air with sticks.

In this species the rims of the ears, the tragus, and lobe are light yellowish, but not so highly colored as in the preceding species.

Measurements.

Number.	Sex.	Length.	Forearm.	Longest finger.	Tibia.	Foot.
WR 1585	Female.....	61	40	84	16	10
WR 1586	Young male.	54	37	71	13	10
WR 1587	Female.....	60	40	84	14.2	9.6
WR 1601	do.....	63	38.4	85	15	10
WR 1602	do.....	60	39	87	14	10
WR 1617	do.....	61	41	86	15	10
WR 1618	do.....	61	38	84	15	9.4
WR 1619	Male.....	59	.....	.....	15	10
102897	do.....	54	40	87	14	9.4

21. GLOSSOPHAGA LONGIROSTRIS Miller.

MILLER'S GLOSSOPHAGA.

1898. *Glossophaga longirostris* MILLER, Proc. Acad. Nat. Sci. Phil. 1898, p. 330.

1900. *Glossophaga longirostris* J. A. ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 89.

Represented by 48 specimens—30 skins and 18 alcoholics.

Found abundantly at La Guaira, Macuto, San Julián, and at Peña de Mora, and in a great variety of situations—in hollow trees, in small caves and crevices in rocks, in holes under bowlders, under the drooping roots dangling from an overhanging bank, in unoccupied huts, in the attics of houses, etc. Nearly all of the females taken were either nursing or else far advanced in pregnancy. A female taken at La Guaira on July 4 measured 67 mm. in length and 292 in extent, and was carrying a young male whose length was 53 and extent 215. The tongue can be extended 34 mm. beyond the tip of the nose. The interfemoral membrane extends 8 mm. beyond the tip of the tail. The mammae are two.

Measurements.

Number.	Sex.	Length.	Tail.	Forearm.	Longest finger.	Tibia.	Foot.	Greatest length of skull.
WR 1458	Female...	67	7	36.6	78	15	11.4	23
WR 1470	Male	70	11	37	81	16	12	23.6
WR 1471	do	70	9	37	77	16	11.4	22.6
WR 1472	do	69	8	37	78	15.4	10.4	23
WR 1473	do	74	7	35.2	79	15	11	23.4
WR 1474	do	70	9	36	77	16	10.4	23
WR 1553	Female...	69	7	36	78	15	11	23
WR 1554	Male	71	8	36	76	15	11	23
WR 1563	Female...	71	8	36	80	15	10	23.2
WR 1610	Male	70	11	36	77	14	11	23
WR 1611	do	68	8	37	78	15	11	23
WR 1614	do	68	8	-----	77	15	11	-----
WR 1658	Female...	74	10	38	78	16	11.6	23.4

22. GLOSSOPHAGA SORICINA (Pallas).

SHREW-LIKE GLOSSOPHAGA.

1897. *Glossophaga soricina*, ALLEN and CHAPMAN, Bull. Amer. Mus. Nat. Hist., IX, p. 15.

1898. *Glossophaga soricina*, J. A. ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 89.

Represented by 4 skins collected at San Julián, where they were found associating with the much commoner species, *G. longirostris*. The habits of the two species are evidently the same.

Measurements.

Number.	Sex.	Length.	Tail.	Fore-arm.	Longest finger.	Tibia.	Foot.	Greatest length of skull.	Remarks.
WR 1577	Female...	63	7	33	70	13	9	20.6	
WR 1612	Male	62	8	33	70	13.4	9.2	20.6	
WR 1613	Female...	63	8	33	65	14	10	21	
WR 1629	do	63	9	33	68	13	10	21	Pregnant.

23. *HEMIDERMA BREVICAUDUM* (Wied).

SHORT-TAILED HEMIDERMA.

1878. *Carollia brevicauda* DOBSON, Cat. Chiropt. Brit. Mus., p. 493.

1897. *Hemiderma brevicaudum* ALLEN and CHAPMAN, Bull. Amer. Mus. Nat. Hist., IX, p. 15.

1900. *Hemiderma brevicauda* J. A. ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 90.

Two males were secured at San Julián. The first was caught in a net as it darted out from under an overhanging rock where it was in company with several others of the same species, and with a number of the common *Glossophaga*. The second was shot a few days later in a small cave where it hung among a cluster of the *Glossophagas*.

Measurements.

Number.	Sex.	Length.	Tail.	Forearm.	Longest finger.	Tibia.	Foot.
WR 1609	Male....	77	14	44	101	19	13
WR 1653	do....	73	11	43	95	18	13

24. *PHYLLOSTOMA HASTATUM* (Pallas).

SPEAR-NOSED BAT.

1878. *Phyllostoma hastatum* DOBSON, Cat. Chiropt. Brit. Mus., p. 484.

1897. *Phyllostoma hastatum* ALLEN and CHAPMAN, Bull. Amer. Mus. Nat. Hist., IX, p. 15.

1900. *Phyllostoma hastatum* J. A. ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 90.

Represented by 20 specimens. Most of these bats were purchased from a native boy who found them in a hollow tree at Macuto. A bunch of smoking palm leaves was applied to the opening in the tree and as the bats flew out they were struck down with sticks or caught in a butterfly net. One specimen was struck down with a cane one evening in the city of La Guaira, and on August 3 one was shot at San Julián as it hung from a branch in the edge of the forest. Some individuals of this species were seen roosting in an unused house at Macuto.

Like the *Molossi* this bat appears in two color phases, a dark one, between black and clove brown, which is characteristic of all the young, and a red phase, between tawny and chestnut. No. 1620, Robinson collection, presents a mottled appearance due to an admixture of the two phases.

This is the largest species of bat taken, some specimens exceeding 2 feet in expanse.

Measurements.

No.	Sex.	Length.	Tail.	Fore-arm.	Longest finger.	Tibia.	Foot.	Remarks.
WR 1464	Female...	130	20	81	154	29	20	Black phase; skin.
WR 1465	do.....	130	17	81	157	30	20	Red phase; skin.
WR 1466	do.....	133	19					do.
WR 1508	Male.....	133	20	79	143	29	20	Black phase; skin.
WR 1620	Female...	124	19	84	163	30	21	Red and black; skin.
102898	do.....	138	17	81	158	30	20	Red phase; skin.
102902	do.....	122	18	83	160	33	20	do.
102904	do.....	125	14	80	163	32	21	Black phase; skin.
102905	Male.....	135	21	85	159	32	20	do.
102906	do.....	120	15	88	157	34	20	Black phase; alcoholic.
102907	Female...	118	12	83	158	31	19	Red phase; alcoholic.
102908	Male.....	110	14	82	157	29	19	Black phase; alcoholic.
102911	do.....	115	13	81	153	30	21	do.
102912	do.....	116	12	85	161	32	19	do.

25. MICRONYCTERIS MEGALOTIS (Gray.)

COMMON LONG-EARED BAT.

1878. *Schizostoma megalotis* DOBSON, Cat. Chiropt. Brit. Mus., p. 478.

1900. *Micronycteris megalotis* J. A. ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 90.

On July 3, in the ravine to the east of La Guaira, a native was met who, in answer to questions, stated that he knew where there were some bats in a cave near by. Upon being asked to point out the place, he went to a pile of vine-covered, waterworn bowlders 20 feet away and, kneeling down, parted the leaves and revealed a small opening several feet wide and 18 inches high. By lying prone and waiting until the eyes grew accustomed to the faint light it was seen that the opening extended about 4 feet under the bowlder and that a small cluster of bats of this species was clinging to the stone above. When disturbed they flew out, but some returned and others lit under overhanging stones near by. Two were shot and two caught in the butterfly net. One female was carrying a large-sized young.

At San Julián they were found in little communities of not over six individuals and in every case were in most insignificant little openings, usually beneath waterworn bowlders.

A pair were taken in a similar position at El Valle, island of Margarita, Venezuela, by Captain Robinson on July 12, 1895. The female was well advanced in pregnancy.

All of the females taken at San Julián during the last week of July and first week of August were nursing well-grown young.

Measurements.

No.	Sex.	Length.	Tail.	Fore-arm.	Longest finger.	Tibia.	Foot.	Remarks.
WR 1452	Male.....	62	14	32	62	13	9	Skin.
WR 1463	do.....	57	12	34	65	15	9.6	do.
WR 1599	do.....	58	12	33	61	14	8	do.
WR 1626	Female...	61	14	34	67	14	10	Nursing one young; skin.
WR 1627	do.....	59	13	.....	65	15	9	do.
WR 1628	do.....	58	13	.....	65	15	9	do.
WR 1634	do.....	58	13	33.6	67	15	10	do.
WR 1635	do.....	61	12	34	64	15	9	do.
WR 1657	Male.....	62	12	32	62	14	8.4	
102913	do.....	56	11	32	61	15	9	
102915	Female...	54	13	34.6	65	16	9.6	Nursing one young; alcoholic.
102916	Male.....	50	12	33	61	15	10	Alcoholic.

26. *LOPHOSTOMA VENEZUELÆ*, new species.VENEZUELAN *LOPHOSTOMA*.

Type.—Adult female preserved in alcohol, No. 102919, U.S.N.M. From Macuto, Venezuela.

Characters.—Like *Lophostoma braziliense* in size, but resembling *L. amblyotis* in the possession of the low band across the forehead between the ears and the narrow interorbital constriction of the skull. It apparently bears the same relation to *L. amblyotis* that *L. braziliense* bears to *L. bidens*.

Color.—Type; isabella color throughout, but much lighter on the under parts than above. The two males are dark drab, but much lighter on the under parts. One of them, No. 102918, has a few irregular patches of wood brown about the shoulder and top of the head. The hairs in all the specimens are nearly white at the bases. The fur is about 8 mm. long on the back. Above it extends over the humerus and halfway up the forearm and about halfway down the femur. Below it has the same extension, but is scantier.

Membranes.—Entirely naked except for a few short, dark hairs in the angle of the elbow above, and a few long, light scanty ones about the elbow joint beneath. Uropatagium large, coming from entire leg and the long calcar. Membranes blackish brown.

Ears.—Large and wide, united by a low band across forehead. When laid forward they extend 5 mm. beyond tip of muzzle. The outer half is marked with about 15 striations. Tragus long, pointed at the apex, two-toothed about the middle, when laid forward reaching to the middle of the eye. Antitragus a small rounded lobe.

Chin with 10 rounded warts arranged in a semicircle, inside of which are 4 secondary warts. Nose leaf cordate-lanceolate, a row of 2 or 3 small warts arranged vertically in the median line between the nostrils. The tail does not project from the interfemoral membrane.

Cranial measurements of the type.—Greatest length, 21.2; basal length, 17.4; basilar length, 16; median palatal length, 9; breadth of palate at first premolar, 2.4; at second molar, 3.6; zygomatic breadth, 10.4; mastoid breadth, 9.8; greatest breadth of brain case, 8.4; least interorbital breadth, 3.2; breadth of rostrum at premolars, 4.4; depth of cranium from sagittal ridge to basi-sphenoid, 8.4; greatest length of mandible, 14; depth of mandible from coronoid process, 6; length of upper tooth row from front of canine, 7.4; greatest width between upper tooth rows from external surfaces of teeth, 6.8; length of lower tooth row from front of canine, 8.4.

Measurements.

	102919, female type.	102918, male adult.	102920, male young adult.
Length:			
Total.....	65	64	58
Tail.....	11	10	10
Ear from meatus.....	25	22	22
Tragus.....	10	8	8.2
Width, ear.....	17	17	17
Height of nose leaf from lower edge of upper lip.....	9	8	10
Greatest width nose leaf.....	6.2	5	6
Length of—			
Forearm.....	38	40	39
Thumb.....	14	12.4	13
Third finger (longest).....	71	74	75
Metacarpal.....	31	30.6	32
First phalanx.....	13.6	14	14.4
Second phalanx.....	15	15.6	16.6
Fourth finger—			
Metacarpal.....	30	32	33
First phalanx.....	13.6	14	15
Second phalanx.....	11	12	13
Fifth finger—			
Metacarpal.....	32	34	34.4
First phalanx.....	13	15	15
Second phalanx.....	12	11.4	12
Tibia.....	20	20	21
Foot.....	10	11	11.4
Calcaneum.....	13	13.6	15

The three specimens were brought in by a boy at Macuto, who said that they were found in a small cave under a pile of rocks.

27. THYROPTERA DISCIFERA (Lichenstein and Peters).

DISC BAT.

1896. *Thyroptera discifera* MILLER, Proc. Biol. Soc. Wash., X, p. 109.

This rare and interesting bat is represented by 10 adults and 7 young. The specimens measure slightly larger than two alcoholics from Nicaragua. With more material from Central America the Venezuelan specimens may be found to represent a larger race. The adults give the following measurements:

Measurements.

No.	Sex.	Length.	Tail.	Fore-arm.	Longest finger.	Tibia.	Foot.	Remarks.
WR 1510	Female...	75	32	35	66	15.4	5	Skin.
WR 1511	do.....	76	28	35	66	16	5.2	do.
WR 1513	Male.....	76	28	32.6	64	15	5	do.
WR 1515	Female...	80	28	33.2	64	15.2	5	do.
WR 1533	Male.....	74	30	32.4	64	15	5	do.
WR 1535	Female...	74	27	33	62	14	5	do.
102926	do.....	80	32	35	64	16	5.2	do.
102927	do.....	70	33	34	64	15	5	do.
102922	Male.....	67	26	34.4	63	15.4	5	Alcoholic.
102923	Female...	72	27	35	67	16	5.4	do.

On July 17, at San Julián, ten of these little bats were brought in by a native, who had caught them with one grasp of his hand, as they clung closely grouped on the under surface of a dead banana leaf. His attention had been attracted to them by their droppings on the ground

beneath. To carry them, he had simply wrapped them up in a piece of the leaf to which they clung, and by the time they were brought in all but one were smothered. This one was placed under an inverted tumbler, to the vertical surface of which it adhered with ease, the vacuum spots under its disks glistening like globules of quicksilver. On July 21 seven more were brought in by a native, who had captured them in the same manner as the first. He stated that two or three had escaped. Of this second lot several were alive and unhurt. Both lots contained males, females, and young. The young, although still nursing and clinging to their mothers, were able to fly with ease.

The sucking disks having largely usurped the clinging functions of the thumb and toes, these latter have dwindled to insignificant proportions, the hind feet being especially weak and partly attached to the interfemoral membrane. The disk at the base of the thumb is much larger than the one at the ankle, being about 3.5 mm. in diameter as compared to 2 mm. in the latter. The surface of these disks appears to be constantly moist, so as insure perfect contact with smooth surfaces, and the bats cling to the under surface of leaves or to the sides of a glass without any effort to use their claws.

Young nursing bats cling to their mother's neck or breast with claws and teeth and are carried about as she flies, even when they almost equal her in size and when their weight makes her flight labored and slow. With this species the sucking disks are of no help in clinging to fur, and the claws are so small and weak as to be almost useless; nevertheless, the young manage to hold on with no risk of falling. The mammae of the female are strap-like, broad and flat, 3 mm. wide by 2 mm. long. Seizing one in his teeth, the young holds on like a bulldog, dangling by the strength of his jaws alone. One of the young that was brought in hung in this way for twenty minutes, and in all that time made no effort to grasp its mother with its claws.

28. *MOLOSSUS RUFUS* Geoffroy.

RUFOUS MOLOSSUS.

1878. *Molossus rufus* DOBSON, Cat. Chiropt. Brit. Mus., p. 112.

1897. *Molossus rufus* ALLEN and CHAPMAN, Bull. Amer. Mus. Nat. Hist., IX, p. 14.

This species is represented by a series of 71 specimens—44 skins and 27 alcoholics—consisting of adults of both sexes, as well as very immature to nearly full-grown young. The very young are almost naked and the surface of their body is smooth and of a bluish-black color. The first coat of hair is invariably black. Among the adults there is considerable variation in color. In the majority it is some form of reddish brown; but six of the adult skins are entirely melanistic. About half of the specimens have a prevailing seal-brown coloration. Four

have a general color of burnt umber or chestnut, and three are dark tawny, mottled with deep brown.

All were obtained from the natives. On the 6th of July there were brought in 26 alive in a sack, and on the following day 39 more. Later, still others were brought in. The adult females were all nursing, although the majority of the young were able to fly. These bats are very rat-like in their actions, running about on a horizontal surface with ease and rapidity. Some that were liberated made no attempt to rise from the floor, but scurried first to an open window and did not spread their wings until they had launched themselves into the air. They were all captured in unused houses, where they stow themselves in the cracks, between the roof and the walls. When poked out they dropped to the floor and crawled about, and did not fly away like other bats, though perfectly able to do so.

They possess a peculiar gland in the throat, lying in front of the larynx. It is rudimentary in the female, but in the male it is about the size and shape of a white bean. It lies transversely under the skin and exudes a whitish, creamy fluid, which has a faint, but characteristic disagreeable odor. This persists in the dried skins, so that the sexes can be separated by the sense of smell.

Bats of this genus could be seen flying rapidly about early in the morning just before sunrise and in the evening just after sundown. Their flight is very rapid, and their pointed tails readily distinguish them from other bats.

Measurements.

No.	Sex.	Length.	Tail.	Forearm.	Longest finger.	Tibia.	Foot.
102737	Female...	118	40	46	86	15	13
102738	Male	127	40	48	91	16	12
102741	do	129	47	46.4	93	19	14.4
102742	Young						
	male...	123	42	45	83	16	13
102745	Female...	114	43	45	87	17	12
102746	do	118	34	46	91	17	12
102747	do	115	34	45.4	87	16	11.4
102748	do	120	35	45	86	18	12
102749	Male	128	36	46	95	18	13
102750	do	131	36	48	91	17.4	12
102751	Female...	108	39	45	88	18	12
102752	Male	118	42	47	88	17.4	13
102753	do	120	33	46	91	17	13
102754	Female...	117	35	46	87	17.4	13
102765	do	124	38	46	89	16	12
102766	do	122	42	47	89	17	12
102767	Male	123	43	46	92	18	12
102768	do	130	43	46	90	18	12
WR 1475	do	121	44				
WR 1477	Female...	121	44				
WR 1478	do	125	45				
WR 1479	Male	128	45				
WR 1480	Female...	127	44	46	89	17	12
WR 1482	do	130	45				
WR 1483	do	124	44				
WR 1488	Male	126	44				
WR 1489	Female...	119	40				
WR 1490	do	121	39				

29. MOLOSSUS OBSCURUS Geoffroy.

LITTLE MOLOSSUS.

1878. *Molossus obscurus* DOBSON, Cat. Chiropt. Brit. Mus., p. 410.

1897. *Molossus obscurus* ALLEN and CHAPMAN, Bull. Amer. Mus. Nat. Hist., IX, p. 14.

First obtained by Captain Robinson, at San Julián, in the form of a skull taken from the stomach of a bat falcon (*Falco albogularis*, Daudin). Later five others were secured at Macuto. Its habits and flight are identical with those of the larger *M. rufus*.

Measurements.

No.	Sex.	Length.	Tail.	Forearm.	Longest finger.	Tibia.	Foot.	Remarks.
102798	Female.....	95	32	38	75	12	8	Alcoholic.
102799	do.....	90	30	36	69	12	8	do.
102800	Male.....	96	31	40	72	13	9	Skin.
102801	Female.....	87	31	39	73	12	8	do.
102802	Young female..	76	28	28	45	12	8	do.

30. PEROPTERYX KAPPLERI Peters.

LARGE SAC-WINGED BAT.

1878. *Saccopteryx kappleri* DOBSON, Cat. Chiropt. Brit. Mus., p. 374.

This bat, which has usually been regarded as a mere local variety or an age variation of *P. canina*, is represented by a splendid series of 16 specimens, all taken by Captain Robinson, at San Julián.

The tail is free for 3 mm. on the upper surface of the membrane, which extends for 24 mm. beyond the tip.

The first of these bats was prodded out from a deep crevice that extended horizontally under a large boulder, and was caught in a butterfly net. It was alone. Several weeks later a number were discovered in a small cave formed by a huge rock that rested against a larger vertical one, leaving a tunnel-like opening beneath. This and the following species resemble each other closely in habits and general form, but differ in size and color. Their pointed muzzle and overhanging upper lip, pompadour bang, and protruding eyes, rather large for a bat and much more protuberant than in other genera, give them somewhat the countenance of a King Charles spaniel. The two nipples of the nursing females are long and fusiform. The wing sacs are much larger in the males than in the females, but do not approach in size those of *Saccopteryx leptura*.

Some were found hanging from a horizontal surface, but the majority clung to a more or less vertical wall. They can be told at a glance, as they brace themselves by their widely-spread forearms which, being excessively long, give them a rather "sprangly" appearance. They are easily caught, some even permitting themselves to be picked off by hand, while the *Glossophagas*, which inhabit similar caves, begin to flutter about at the first intrusion and seek to dart by and escape.

Measurements.

No.	Sex.	Length.	Tail.	Forearm.	Longest finger.	Tibia.	Foot.	Length of skull.	Width of skull.	Remarks.
WR 1498	Male	71	15	47	80	18.6	8.6	17	10.5	Skin.
WR 1570	Female	75	14	51	86	21.6	11	18	11	do.
WR 1571	Male	74	14	48	76	20	10	17	10.5	Alcoholic.
WR 1572	Young male.	72	13	47	75	19	10	17.5	11	Skin.
WR 1573	Male	73	14	47	79	19	10	17.5	11	do.
WR 1574	Young male.	72	14	48	82	19	9.2	17	11	do.
WR 1575	do	77	16	51	84	22	11	17.5	11	do.
WR 1588	Female	80	16	49	85	19.6	10	17	11	do.
WR 1589	Male	79	17	48.5	84	19.4	10	18	11	do.
WR 1590	do	83	18	49	85	19.2	10	17.5	11	do.
WR 1591	Young female	78	15	50	81	20.2	11	17.5	11	do.
WR 1592	Female	80	16	52	86	20	10	18	11	do.
WR 1600	Male	77	15	48	82	19	9.4	17.5	11	do.
WR 1643	Female	80	15	48	86	19.2	9.4	17	11	do.
WR 1644	do	77	15	49	86	19.6	10	17	11	do.
WR 1645	Male	77	14	48	78	20	9.4	17	11	Alcoholic.

31. PEROPTERYX CANINA (Wied).

LITTLE SAC-WINGED BAT.

1878. *Saccopteryx canina* DOBSON, Cat. Chiropt. Brit. Mus., p. 373.

1900. *Peropteryx canina* J. A. ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 93.

A short distance below the summit of the first foot hill which walls in the west bank of the ravine east of La Guaira, there runs a small shelf, and in the vertical rock which forms its back there are a few irregular cavities, not large enough to be designated as caves. They are so shallow that the light enters freely, and they do little more than afford a shade from the glare outside. Here was found, on July 9, a small colony of the present species, and twelve were taken. On the following day the spot was revisited, but only four were seen, of which two were captured. These two were females, one containing a foetus ready for exclusion, the other carrying a large young one clinging about her neck. When disturbed in one cavity they flitted to the adjoining one, returning to the original point when again disturbed, and so on. They take the same sprawling position as the preceding species. In addition to being smaller, they are more reddish than *P. Kappleri*. The interfemoral membrane extends 19 mm. beyond the tip of the tail.

Measurements.

No.	Sex.	Length.	Tail.	Forearm.	Longest finger.	Tibia.	Foot.	Length of skull.	Width of skull.	Remarks.
WR 1485	Male	63	13	41	68	19	8.2	14	8	Skin.
WR 1486	Female	65	14	43	72	18.2	8.2	14	8.5	do.
WR 1487	do	64	13	43	75	17.6	8.6	15	8.5	do.
WR 1491	do	65	14	42	72	18	8.4	14	8.5	do.
102929	do	67	16	44	74	19	9	14	8	do.
102930	do	64	15	42	71	18	8	14	8	do.
102932	do	60	15	42	73	19	7.4	14	8	do.
102934	do	60	15	45	72	19	8	14	8	Alcoholic.
102935	do	58	15	43	68	18.4	7.6	14	8	do.
102936	Male	50	14	41	69	18.2	8	14	8	do.
102939	do	56	12	42	70	18.2	8.4	14	8	do.

32. *SACCOPTERYX LEPTURA* (Schreber).

STRIPED SAC-WINGED BAT.

1878. *Saccopteryx leptura* DOBSON, Cat. Chiropt. Brit. Mus., p. 371.

1897. *Saccopteryx leptura* ALLEN and CHAPMAN, Bull. Amer. Mus. Nat. Hist., IX, p. 14.

1900. *Saccopteryx leptura* J. A. ALLEN, Bull. Amer. Mus. Nat. Hist., XIII, p. 94.

Of this species, only three specimens were obtained—a male and two females—all from San Julián. The male was cut down with a pole as it flew about the hut at dusk; a female was secured in the same manner a few days later, and the third was shot in a small cave, where it was in company with *Peropteryx kappleri* and *Glossophaga longirostris*. This species differs greatly in general appearance from the other two species of sac-winged bats; It lacks the pompadour bang, its ears are very differently shaped and proportioned, the wing sacs are differently located, are operated by a larger muscle, are larger, and are very different on the interior. Both sexes have the sacs, but those of the male are much the larger. When opened, the interior is seen to be coarsely rugose and whitish in color. The odor emitted is not very decided.

The two whitish lines on the back are not parallel but wavy, making a double lyre-shaped pattern as they extend out upon the interfemoral membrane.

Both females contained fœtuses ready for exclusion.

Measurements.

No.	Sex.	Length.	Tail.	Fore-arm.	Longest finger.	Tibia.	Foot.
WR 1537	Male.....	58	18	39	69	16	6.6
WR 1567	Female....	64	16	42	72	17	7
WR 1642	do....	65	15	40	70	17	7

33. *LASIURUS BLOSSEVILLEI* (Férussac).

SOUTH AMERICAN RED BAT.

One specimen preserved in alcohol, a nearly adult male. It was brought in by a small boy at Macuto. The specimen, although presenting some differences from topotypes of *L. blossevilliei* from Paraguay, seems not to be separable from it, as the differences are slight and may be due to age. The Venezuelan bat is in every way a slightly smaller animal. The ear is smaller than that of Paraguayan specimens, with smaller tragus, which is straighter and less convex anteriorly. The skull is smaller, with a rather relatively shorter facial portion. The palate is narrower, and also the notch between the incisors in front. Compared with the Mexican red bat, it differs in being somewhat smaller, which may be due to its immaturity, and in having a slightly narrower ear, a noticeably smaller skull, relatively smaller

audital bullæ, narrower palate, smaller teeth, and much narrower intermaxillary notch.

Its dimensions are: Length, 82; tail, 44; forearm, 38; longest finger, 75; tibia, 18; and foot, 7.

NOTE.

In addition to the foregoing, Captain Robinson saw evidences or gathered information at San Julián of the occurrence of some twenty-odd other mammals, among them:

1. *Chironectes* sp. (local name "perro de agua," i. e., water dog). The natives described a spotted, or striped, web-footed opossum which they had killed in the stream at San Julián. It was said to be scarce.

2. *Sloth* sp. (local name "pereza"). Described as being tolerably common in the forests and feeding on the leaves of the aruma. In the market at Caracas the hides of two species were seen; one with coarse grayish hair, the other with a peculiar mark in the back consisting of a round spot of orange, rimmed with black and divided longitudinally by a black line.

3. "*Oso hormiguero*," i. e., ant bear. Occasionally met with at San Julián. There was seen in the market at Caracas a small flaxen-haired hide, said to be the skin of this animal.

4. *Tatus novemcincta* (local names "cupa" and "cachicamo"). Described as being more common than the *Cabassous*. There was seen in a hut at San Julián the dried carapace of one of these animals, which was used as a tobacco box.

5. *Odocoileus* sp. (local name "venado"). Several sets of branching antlers were seen at San Julián. They were said to come from a deer considerably larger than the following.

6. *Mazama* sp. Two were killed at San Julián in July, but both were cut up before they could be secured as specimens. They were quite small, about the size of a goat, but with longer and slenderer legs. Their horns, or "cachos" are mere spikes a couple of inches in length.

7. Tapirs (local name "danta") are occasionally killed at San Julián. A native at that place had a couple of hoofs or nails of a tapir which had been killed near by. The scrapings of these mixed with wine made what he declared to be an infallible remedy against weak heart.

8. *Coendou prehensile*, Porcupine. One of these was offered for sale at La Guaira, and the intention was to purchase it for the National Zoölogical Park, but before the sale was effected it gnawed out of its cage and made good its escape.

9. *Dasyprocta* sp. (local name "acurri"). Described as a yellowish brown guinea pig, considerably larger than the domesticated species, but smaller than the lapa, and found in the woods back of San Julián.

10. *Lepus* sp. (local name "conejo"). The natives say that rabbits

are found, but are scarce. On the island of Margarita *Lepus margaritæ* is so plentiful that the animals are split and dried like codfish and brought by the boat load to La Guaira for sale.

11. *Felis*, Jaguar. Local name, "tigre." Several have been killed within the last five years within 10 miles of La Guaira. Many hides were seen in the market at Caracas. The natives say that this is the only Venezuelan beast of prey that will attack man. Like its cousin, the leopard, it has a great fondness for dog's flesh. There was hardly a native at San Julián who at some time in the past had not lost one or more dogs by jaguars.

12. *Felis*, Puma. Local name "leon." Not rare. Many hides were seen in the market at Caracas. The puma does not attack dogs, but is destructive to goats, calves, and pigs. It is described as very cowardly.

13. *Felis* sp. Numerous hides of tiger cats were seen. According to the natives three species of small cats were found at San Julián; the "tigrillo," or "tigre cunaguaro," probably the ocelot; the "zorro oncita," a spotted cat smaller than the preceding, and a third, still smaller, tawny or brownish color, without spots.

14. *Procyon* sp. ? Local name, "zorro lava tu mano," i. e., "fox wash thy hand." Said to be common around San Julián, and described as having a ringed tail, frequenting the vicinity of streams and climbing well.

15. *Conepatus* sp. ? Local name, "mapurito." Common at San Julián, where their unmistakable odor was frequently noticed at night, and where were often seen their excavations, where they had dug out lizard eggs or insects.

16. *Galictis* sp. ? Local name, "zorro guapán." A hide seen at San Julián indicated an animal of about the size and proportions of an otter. It was chocolate brown, with tawny neck and head.

17. "Mona euchi euchi," a nocturnal monkey of medium size.

18. "Mona tui tui," a very small monkey, usually found in pairs. It attempts to hide like a squirrel, instead of making off as do the other monkeys.

19. "Macaco," a large monkey.

20. "Mona frontina," a white-crowned monkey, which barks like a dog.

21. *Myctes* sp. Local name, "arajuata." At San Julián the roaring of these monkeys was heard on several occasions, but the animals frequented an inaccessible mountain crest, and no specimens could be obtained. Their cry is indescribably wild. It starts with a series of short barks in deep tone, increasing progressively in rapidity, and sounding at a distance like the puffs of a heavy locomotive as it pulls out. Finally it winds up with a prolonged sullen roar of great volume.

AN ANNOTATED LIST OF BIRDS COLLECTED IN THE VICINITY OF LA GUAIRA, VENEZUELA.

By WIRT ROBINSON,

Captain, U. S. Army,

and

CHARLES W. RICHMOND,

Assistant Curator of Birds.

The following list embraces two collections made by Captain Robinson, one in the summer of 1895¹ and the other in the summer of 1900, together with a few specimens collected by Mr. Marcus W. Lyon, jr., who accompanied Captain Robinson on his second trip. In this list the identifications, descriptions of new species, and critical notes are by Dr. Richmond and the field notes by Captain Robinson.

For detailed information relating to the second trip, the localities visited, etc., the reader is referred to the introductory remarks in the paper on the mammals, pages 135 to 162 of this volume.

Family TINAMIDÆ.

1. CRYPTURUS SOUI (Hermann).

PILEATED TINAMOU.

Local name: Ponchita.

Three were obtained at San Julián, where they were found in the brush on the lower hills. A female taken August 8 contained an egg nearly ready for exclusion, the shell being partly formed, although still soft and not pigmented. Its dimensions were 40 by 30 mm. (1½ by 1¼ inches). There was in the ovaries a second egg the size of a cherry. The natives stated that it lays but two eggs. Its flesh is white and tender. Irides light brown; tarsi olive.

Another and considerably larger species of tinamou was said to be found at San Julián.

¹ For details of this trip, see An Annotated List of Birds Observed in Margarita Island and at Guanta and La Guaira, Venezuela, by Wirt Robinson, Proc. U. S. Nat. Mus., XVIII (1895), pp. 649-685.

Family LARIDÆ.

2. LARUS ATRICILLA (Linnæus).

LAUGHING GULL.

Small flocks of 6 or 8 seen along the beaches at La Guaira.

Family PELECANIDÆ.

3. PELECANUS OCCIDENTALIS (Linnæus).

BROWN PELICAN.

A good many seen near La Guaira and around a mangrove swamp at San Julián.

Family FREGATIDÆ.

4. FREGATA AQUILA (Linnæus).

MAN-O'-WAR BIRD.

Common in the vicinity of La Guaira.

Family ARDEIDÆ.

5. TIGRISOMA SALMONI Sclater and Salvin.

SALMON'S TIGER BITTERN.

Mr. Lyon secured a specimen at Macuto on August 10. It was young, the neck feathers showing still the characteristic yellow filamentous tippings.

Dr. Sharpe has placed *T. cabanisi* of Central America in a new genus, *Heterocnus*, on account of its naked throat. However, in both his original diagnosis¹ and his key² he has reversed the actual conditions, making *Heterocnus* the form with the throat feathered on the median line, and *Tigrisoma* the naked-throated one.

Family SCOLOPACIDÆ.

6. TRINGA MINUTILLA Vieillot.

LEAST SANDPIPER.

A specimen was found dead by a puddle in the road near Macuto on August 10. It was greatly emaciated. Tarsi greenish yellow.

7. EREUNETES PUSILLUS (Linnæus).

SEMIPALMATED SANDPIPER.

Two specimens were given to Mr. Lyon at Macuto on August 10 by a boy who had snared them on the beach. Tarsi dark green.

¹ Bull. Brit. Orn. Club, V, 1895, p. xiv.

² Cat. Birds Brit. Mus., XXVI, 1898, p. 59.

8. *ACTITIS MACULARIA* (Linnæus).

SPOTTED SANDPIPER.

Mr. Lyon obtained a female at Macuto August 4.

Family CRACIDÆ.

9. *CRAX DAUBENTONI* Gray.

DAUBENTON'S CURASSOW.

Local name: Pauzi.

None of these were seen in a wild state, but three were purchased at La Guaira and brought back to the Zoological Park in Washington. In two of these the beak was solid black, but the third had the base clear light yellow. They were said to be quite common about 5 miles east of San Julián. They have the habit of erecting and throwing forward their fine, recurved crest. In captivity they are a much quieter bird than the guacharaca, their principal note being a long, descending whistle, almost exactly like the sound made when the air brakes on a train are released.

While at San Julián the natives several times reported that they had seen some "camates," a bird described as midway in size between a pauxi and a guacharaca.

10. *ORTALIS RUFICAUDA* Jardine.

GUACHARACA.

A few very shy individuals were seen up the ravine east of La Guaira. At San Julián they were plentiful on the wooded slopes around the valley. Eight were secured here, of which five were preserved, and in addition six of various ages were purchased and brought back alive. At San Julián they uttered their characteristic noisy cries at daybreak and at sunset. They usually go in pairs. When they are approached they keep up an incessant call of alarm, yet all the time conceal themselves in the tree tops with great cunning, and it is not at all easy to get within range.

It is difficult to convey an idea of the resonant, vibrant, and trumpet-like quality of their notes. The tone is somewhat like that of a guinea-fowl, but much more voluminous. The call note is uttered by the male, who is aided by a peculiar development of the windpipe. This, before passing into the thorax, runs down between the skin and flesh of the breast to the lower end of the sternum, thence back to the neck.

As far as was observed they kept strictly to the branches of the trees. The stomachs of those killed were filled with the buds and blossoms of a small but very pretty white and yellow passion flower. They also feed on plantains and other fruit. They are much hunted

for food, their flesh being white and of fine flavor. When captured young they are easily domesticated, and associate freely with chickens. They are continually erecting and throwing forward their frontal crest. They have under the throat two oblong bare spots. These are red in life, and on hot days, when the birds are panting, hang down like wattles. The beak and tarsi are blue, and skin of face dark blue.

Family COLUMBIDÆ.

11. COLUMBA PLUMBEA Vieillot.

WINE-COLORED PIGEON.

Local name: Falta poco, from the fancied resemblance of its call of four notes to those words.

One specimen, a female, was obtained at San Julián on August 3. It differs from the other doves and pigeons seen at that place in its note, which is a whistle and not a coo, and in the color of its irides, which are light grayish blue, instead of reddish yellow. Its flesh is said to have an unpleasant, bitter taste.

Tarsi pink, lids red.

12. LEPTOTILA INSULARIS Richmond.

MARGARITAN DOVE.

Local name: Paloma, i. e., dove.

Abundant. This is the common object of pursuit of the gunners, and numbers are caught by the children in coop traps with figure-four triggers and in snares of horse hair. Many fledglings were seen at San Julián. They differ very markedly in color from the adults, being much darker and mottled, the back bronzy-green and purple in places.

Feet purplish in the young. Adults have the irides yellow, feet reddish.

Three specimens were secured, which are to be referred to the Margaritan form, although they average a trifle larger in wing measurements.

Family PERISTERIDÆ.

13. SCARDAFELLA RIDGWAYI Richmond.

RIDGWAY'S SCALED DOVE.

A few were seen in the dry cactus region along the coast at the mouth of the San Julián Valley. Their notes give them the name "potoco." One specimen, a male, was shot July 11.

This is the same as the Margaritan form. Those who do not wish to recognize this bird as different from that of Brazil will still have to use the name *ridgwayi*, as the term *squamosa* is preoccupied.

14. COLUMBIGALLINA PASSERINA¹ (Linnæus).

GROUND DOVE.

Local name: Tórtola, i. e., turtle dove.

Very abundant. They were nesting in July and August and a number of nests were seen with the usual complement of two eggs. The nests are not placed in trees as a rule but rather upon brush heaps, in tussocks of coarse grass, on boulders, or on fallen logs. Nests found at San Julián on July 30 and July 31, both on prostrate logs, contained pipped eggs. A pair built on the stump of a papaya tree within 20 feet of the door of our hut and hatched early in August. The young, naked at first, soon assumed a coat of sulphur-yellow down, which with their purplish skin made them unpleasant looking objects.

15. GEOTRYGON VENEZUELENSIS Salvadori.

VENEZUELAN QUAIL DOVE.

Local name: Paloma de monte, i. e., wood dove.

The peculiar booming coo of this dove was occasionally heard at San Julián, but only one specimen was secured, an immature female. Irides bluish, feet purplish.

This specimen is quite young, but without much doubt is of the form called *venezuelensis* by Salvadori.

Family CATHARTIDÆ.

16. CATHARTES AURA (Linnæus).

TURKEY VULTURE.

Not very common. Only a few seen.

17. CATHARISTA URUBU (Vieillot).

BLACK VULTURE.

Very abundant, especially around the slaughter pens east of La Guaira.

Family BUTEONIDÆ.

18. BUTEO ABBREVIATUS Cabanis.

ZONE-TAILED HAWK.

The only specimen obtained, a female, was brought in alive at La Guaira on August 12 by a native, who, discovering it roosting the night before, had crippled it with a stone. Irides brown, cere and tarsi yellow. Several were seen near Macuto.

¹ Proc. U. S. Nat. Mus., XVIII, 1895, p. 659.

19. *MICRASTUR MELANOLEUCUS* (Vieillot).

BLACK AND WHITE MICRASTUR.

One specimen, a male, secured at San Julián on July 28. It was in full molt, changing above from a brown and rufous to a black and white plumage. Its stomach contained a sparrow (*Arremonops*). Cere greenish, irides brown, tarsi yellow.

20. *RUPORNIS MAGNIROSTRIS* (Gmelin).

LARGE-BILLED RUPORNIS.

This noisy hawk was common in the dryer foothills at La Guaira and at San Julián. A female shot on July 19 had its stomach filled with a mass of grasshoppers, crickets, roaches, and other insects, and parts of several scorpions. Its cere, lids, irides, base of lower mandible, and tarsi were yellow. A male shot July 26 had orange cere and tarsi. Its stomach was filled with a mass of insects and with parts of some small striped lizards. The diet of grasshoppers gives to these birds a characteristic odor which clings to their skins for some time after they have been cured.

21. *LEUCOPTERNIS ALBICOLLIS* (Latham).

WHITE HAWK.

Several of these fine hawks were seen at San Julián, but only one was obtained, a female taken July 16. Its stomach contained a varied assortment—pieces of a snake, crabs, beetles, and grasshoppers. On July 31 one was seen flying around its nest, a bulky mass of sticks in the top of an immense thorny-trunked tree.

Irides light brown, tarsi yellow.

Family FALCONIDÆ.

22. *GAMPSONYX SWAINSONI* Vigors.

SWAINSON'S PEARL KITE.

At San Julián about sunset on July 29 this small hawk, which was at first taken for a gray kingbird, was seen to light in the dead top of a small tree near the road. On being shot it started off as if untouched, but after going some 30 yards spread its wings and settled gently to the earth, where it was found dead. Upon picking it up I was at once struck by its coloration, the absence of bars or stripes on its plumage, the glistening white under surface of its wings, its relatively heavy feet with the tarsi feathered halfway to the toes, the heron-like powder down patches on its hips, and its crimson irides. Its cere was green, tarsi yellow. This was the only one seen, although

the natives stated that it was not rare. It was a female and must have been an industrious hunter, as its stomach contained no less than 5 of the common small striped lizards (*Unemidophorus*).

Dr. Sharpe¹ quotes *Chondrohierax rufifrons* Lesson (first described as *Daedalion rufifrons* Lesson) as a synonym of this species. This name is, however, referable to *Falco uncinatus* Temminck, which species should properly be called *Chondrohierax uncinatus*, as *Regerhinus* Kaup, 1845, is antedated by *Chondrohierax* Lesson, 1843.

23. FALCO ALBOGULARIS Daudin.

WHITE-THROATED BAT FALCON.

A few of these beautiful little falcons were seen around San Julián. They were all in the tops of dead trees high up on the mountain sides. A female was shot on July 19 whose stomach contained fragments of a beetle and the skull and other parts of a *Molossus obscurus*, one of the swiftest flying bats. Irides brown, lids, cere, and tarsi yellow. The striking effect of the clear dark eyes with the brilliant gamboge lids against a background of dark plumage is lost in the stuffed skin.

Family BUBONIDÆ.

24. MEGASCOPS BRASILIANUS (Gmelin).

BRAZILIAN SCREECH OWL.

A pair of screech owls were obtained at San Julián on July 26. They were in poor plumage. Irides yellow.

Other owls were seen but not secured, among them a small owl, probably *Glaucidium*, and a very large owl seen flying at dusk.

Family PSITTACIDÆ.

Parrots of the genera *Ara*, *Amazona*, *Conurus*, and *Psittacula* were seen at San Julián but none were secured.

Family CUCULIDÆ.

25. CROTOPHAGA ANI Linnæus.

ANI.

Local name: Garrapatero, i. e., tick-eater, from its alleged habit of eating the ticks on cattle.

Common in open land about La Guaira and at San Julián. Usually seen in small bands of six to a dozen individuals, and frequently seen walking about almost under the feet of grazing cattle.

¹ British Museum Catalogue of Birds, I, p. 340.

26. *PIAYA CAYANA THERMOPHILA* (Sclater).

SQUIRREL CUCKOO.

Local name: Rabo de ardito, i. e., squirrel tail.

A few seen at La Guaira. Abundant at San Julián. The stomachs of all killed were packed to distension with insects, mainly caterpillars. Beak and lids yellowish green, tarsi bluish, irides red, inside of mouth black.

27. *COCCYZUS MELANOCORYPHUS* Vieillot.

DARK-HEADED CUCKOO.

One specimen obtained at La Guaira, June 25, 1895.

Family RAMPHASTIDÆ.

28. *AULACORHAMPHUS ERYTHROGNATHUS* Gould.

RED-BILLED GREEN TOUCAN.

Local name: Pico de frasco, i. e., bottle beak.

Fairly common at San Julián. Tarsi olive, irides brown.

Toucans of the genus *Ramphastos* are known to the natives at San Julián, who call them "Dios te dé."

Family TROGONIDÆ.

29. *TROGON COLLARIS* Vieillot.

COLLARED TROGON.

Local name: Pavita, i. e., little peacock.

Common at San Julián, and easily found by its clear, loud note. Beak yellow, lids red. The beak of the female is shaded with brownish.

Family GALBULIDÆ.

30. *GALBULA RUFICAUDA* Cuvier.

RUFIOUS-TAILED JACAMAR.

Common at La Guaira and at San Julián. They nest in holes like bank swallows. The natives regard it as a large-sized humming bird and call it "tocuso de montaña," mountain humming bird.

Family ALCEDINIDÆ.

31. *CERYLE AMERICANA* (Gmelin).

SMALLEST GREEN KINGFISHER.

Local name: Martín pescador.

Common along the small streams at La Guaira, Macuto, and San Julián.

Family PICIDÆ.

32. CHLORONERPES RUBIGINOSUS (Swainson).

SWAINSON'S GREEN WOODPECKER.

Two were shot as they were feeding on alligator pears in the coffee plantation at San Julián. Others were seen.

33. MELANERPES SUBELEGANS (Bonaparte).

BONAPARTE'S WOODPECKER.

Abundant. A pair had their nest in the top of a dead papaya tree in front of the hut at San Julián.

34. CAMPEPHILUS MALHERBII Gray.

MALHERBE'S IVORY-BILLED WOODPECKER.

Local name: Carpintero, i. e., carpenter, the general name for all woodpeckers.

Five or six were seen at San Julián, but only one, a female, secured. They were usually seen in lofty dead trees around the edges of mountain clearings. They have a loud, discordant note. Irides yellow, tarsi bluish green, soles of feet yellow.

A piculet (*Picumnus*?) was seen excavating its nest in a dead branch at Cucurutí on July 7, and others were seen at San Julián.

Family CAPRIMULGIDÆ.

35. ANTROSTOMUS RUFUS (Boddaert).

RUFIOUS WHIP-POOR-WILL.

One specimen, a female, secured at San Julián. Other species of goat-suckers were seen.

Family TROCHILIDÆ.

36. GLAUCIS HIRSUTUS (Gmelin).

HAIRY HERMIT.

Quite common at La Guaira and at San Julián. Several nests were seen, all of which were woven to the under side of a tatter at the extreme tip of a banana leaf. A nest taken at La Guaira, on July 4, contained 2 fresh eggs. Another at San Julián, on July 11, contained 2 young, several days old. On July 27 a female was seen building. At San Julián an individual largely blotched with white on the back and rump was seen several times.

Mandible bright yellow, not flesh color as stated by Elliot.

37. *DOLEROMYA FALLAX* (Bourcier).

BUFF-BREASTED HUMMING BIRD.

One specimen taken at San Julián in an extensive cactus thicket on the dry lowlands. I do not think that this species is ever found outside of such localities.

The characters given for the Margaritan form (of which we have fifteen or more examples) are perfectly good, and *pallida* is readily to be distinguished from *fallax*.

38. *PHÆTHORNIS AUGUSTI* (Bourcier).

SALLÉ'S HERMIT.

Seen in the ravines at La Guaira, at San Julián, and at Cucurutí. On July 24 at San Julián, in search of bats, I crept on hands and knees into a sort of cave made by an immense slab of stone leaning against another. At some distance from the entrance an object dangling from the rocky roof brushed against my head. Striking a match to examine it, I was surprised to find it the nest of a humming bird. The suspending cord, composed of twined spider's webs, was fastened to a projecting splinter of stone, and the nest hung almost a foot below. To keep it upright and to balance the weight of the bird, quite a mass of material was woven below and on the opposite side of the cord. It contained two partly incubated eggs. The parent was secured. A few days later a second nest, similarly situated in a cave and containing a newly hatched young, was found.

Feet flesh color and lower mandible vermilion, not flesh color as stated by Elliot.

The nest of a species of *Phaethornis*, probably *P. superciliosus*, was found at La Guaira on July 5. It was woven to the under side of a leaf. The bird was shot, but fell in a tangle of vines and was lost.

39. *PYGMORNIS LONGUEMAREI* (Lesson).

LONGUEMARE'S PIGMY HERMIT.

Common at San Julián. Basal half of mandible bright yellow, not flesh color.

40. *HYPUROPTILA BUFFONI* (Lesson).

BUFFON'S PLUMETEER.

Common at La Guaira and at San Julián.

41. *CHRYSOLAMPIS MOSCHITUS* (Linnæus).

RUBY and TOPAZ HUMMING BIRD.

One seen at Cucurutí July 7.

42. *AMIZILIS FELICIAE* (Lesson).

FELICIA'S HUMMING BIRD.

Abundant at La Guaira and at San Julián. A nest saddled on a branch and containing one egg was found at La Guaira on July 4. On July 5 a female of this species was seen to make, in the absence of its owner, several visits to the nest of a *Phaethornis* and each time rob it of a portion of its lining.

43. *CHLOROSTILBON CARIBBÆA* Lawrence.

ATALA'S EMERALD.

Abundant in the flat coast region.

Family PIPRIDÆ.

44. *CHIROXIPHIA LANCEOLATA* (Wagler).

LANCE-TAILED MANAKIN.

Fairly common in the well wooded and shaded ravines at La Guaira and at San Julián. A nest with 2 eggs was taken at La Guaira on July 25, 1895.

Family TYRANNIDÆ.

45. *MUSCIVORA TYRANNUS* (Linnæus).

FORK-TAILED FLYCATCHER.

A number seen at San Julián.

46. *TYRANNUS DOMINICENSIS* (Gmelin).

GRAY KING BIRD.

Abundant at San Julián.

47. *PITANGUS DERBIANUS RUFIPENNIS* (Lafresnaye).

RUFIOUS-WINGED DERBY FLYCATCHER.

One male obtained at San Julián July 16. Others seen.

48. *LEPTOPOGON SUPERCILIARIS* Cabanis.

WHITE-BROWED FLYCATCHER.

One specimen taken at San Julián on August 5. Tarsi blue.

Has been previously recorded from Venezuela on one occasion, by Chapman and Phelps.¹

49. *POGONOTRICCUS* sp.

An immature specimen taken at La Guaira in 1895.²

¹ Auk., XIV, 1897, p. 369.² Proc. U. S. Nat. Mus., XVIII, 1895, p. 684.

50. *PLATYRHYNCHUS MYSTACEUS INSULARIS* (Allen).

TOBAGO BROAD-BILLED FLYCATCHER.

One taken at La Guaira in 1895.¹51. *TODIROSTRUM CINEREUM* (Linnæus).

BLACK-CROWNED TODY FLYCATCHER.

Common.

Family FURNARIIDÆ.

52. *SYNALLAXIS STRIATIPLECTUS* Chapman.

STREAKED-BREASTED SPINETAIL.

One obtained and several seen at San Julián, August 5.

Family DENDROCOLAPTIDÆ.

53. *SITTASOMUS PHELPSI* Chapman.

PHELPS'S CREEPER.

One female taken at San Julián, July 18.

54. *DENDROPLEX PICIROSTRIS* (Lafresnaye).

WHITE-THROATED TREE CREEPER.

A number seen at San Julián. Tarsi greenish.

Family FORMICARIIDÆ.

55. *THAMNOPHILUS DOLIATUS* (Linnæus).

BARRED ANT SHRIKE.

Abundant at La Guaira and at San Julián.

56. *THAMNOPHILUS MELANONOTUS* Sclater.

BLACK-BACKED ANT SHRIKE.

One specimen taken at La Guaira, July 5.

57. *FORMICIVORA INTERMEDIA* Cabanis.

INTERMEDIATE ANT WREN.

Abundant in the scrub.

58. *GRALLARIA* sp.

A specimen, apparently a member of this genus, was shot at San Julián July 19, but was too badly injured to be preserved.

¹Proc. U. S. Nat. Mus., XVIII, 1895, p. 684.

Family CORVIDÆ.

59. XANTHOURA CÆRULEOCEPHALA (Dubois).

BLUE-HEADED GREEN JAY.

Local name: Querre querre.

Abundant at San Julián. Found in small flocks in the coffee plantations. Many of their notes are like those of our blue jay.

Family ICTERIDÆ.

60. OSTINOPS DECUMANUS (Pallas).

COMMON OROPÉNDOLA.

Local name: Conoto.

Seen at Cucurutí and in large flocks at San Julián. The variation in size of the individuals of a flock is remarkable. They have a strong, disagreeable odor, which persists for some time in the stuffed skin.

61. OSTINOPS OLEAGINEUS Sclater.

VENEZUELAN GREEN OROPÉNDOLA.

Local name: Conoto.

Large straggling flocks were seen in the coffee plantations at San Julián. They have the same strong smell and vary in size as do the preceding. They have a loud, yelping note, and an alarm note like the cackle of a startled hen. Both species were in very poor plumage.

Feet green, beak light greenish-white.

62. ICTERUS AURICAPILLUS Cassin.

GOLDEN-CROWNED ORIOLE.

Local name: Gonzalito.

Abundant.

Family FRINGILLIDÆ.

63. ARREMONOPS VENEZUELENSIS Ridgway.

VENEZUELAN GROUND-SPARROW.

Local name: Rayadito.

Abundant. Eight specimens were taken in traps baited with bananas and set for small mammals.

64. VOLATINIA JACARINI SPLENDENS (Vieillot).

GLOSSY GRASSQUIT.

Abundant.

65. EUETHEIA OMISSA (Jardine).

VENEZUELAN GRASSQUIT.

Abundant.

Family TANAGRIDÆ.

66. TANAGRA GLAUCOCOLPA (Cabanis).

VENEZUELAN BLUE TANAGER.

The blue tanagers seen were probably of this form. They were abundant.

67. PIRANGA ARDENS Sclater.

BLACK-LORED SCARLET TANAGER.

Local name: Cardinal de montaña, mountain cardinal.

A male taken at San Julián August 3, and several others seen the same day.

68. TACHYPHONUS MELALEUCUS (Sparman).

BLACK AND WHITE TANAGER.

Common.

69. SALTATOR OLIVASCENS Cabanis.

GREY-BREASTED SALTATOR.

A few seen at San Julián, where one was shot as it fed on a ripe papaya fruit.

Family CEREVIDÆ.

70. CHLOROPHANES SPIZA (Linnæus).

GREEN HONEY CREEPER.

One specimen in full molt taken at San Julián July 26. Irides reddish, tarsi dark green, lower mandible and base of upper yellow.

71. CYANERPES CYANEA EXIMIA (Cabanis).

VENEZUELAN GUITGUIT.

Common in the forests at San Julián.

72. CEREBA LUTEOLA Cabanis.

VENEZUELAN HONEY CREEPER.

Abundant in the dry coast region.

Family HIRUNDINIDÆ.

73. PROGNE CHALYBEA (Gmelin).

STEELY-BACKED MARTIN.

Very abundant in La Guaira, where they nested in the crevices along the eaves of the tiled roofs.

74. *ATTICORA CYANOLEUCA* (Vieillot).

BLUE AND WHITE SWALLOW.

Very abundant in and around La Guaira.

Family VIREONIDÆ.

75. *VIREO CHIVI AGILIS* (Lichtenstein).

AGILE VIREO.

Common.

76. *HYLOPHILUS AURANTIIFRONS* Lawrence.

GOLDEN-FRONTED HYLOPHILUS.

One specimen taken at San Julián August 5. Tarsi very pale blue, lower mandible yellowish flesh.

Family MNIOTILTIDÆ.

77. *BASILEUTERUS FLAVEOLUS* Baird.

YELLOW GROUND WARBLER.

One specimen obtained at La Guaira, where it flitted about in the bushes close to the ground much like a redstart, apparently somewhat north of its previously known range.

Family TROGLODYTIDÆ.

78. *RHODINOCICHLA ROSEA* (Lesson).

ROSE-BREASTED WREN.

Local name: Sarta sarta.

Seen at La Guaira and San Julián. It has a wonderfully loud and clear song. It is frequently seen on the ground scratching among the fallen leaves. One specimen, a male, obtained.

This is the true *Furnarius roseus* of Lesson. The Central American bird is quite different and is apparently unnamed.

79. *THRYOTHORUS RUTILUS* Vieillot.

RUFIOUS-BREASTED WREN.

One obtained at La Guaira in 1895.

80. *TROGLODYTES RUFULUS* Cabanis.

WHITE-BREASTED HOUSE WREN.

Abundant at La Guaira, nesting at the base of the leaf stalks of the cocoa palms.

81. MICROCERCULUS PECTORALIS, new species.

SCRUB WREN.

When at La Guaira on July 25, 1895, I saw walking about in the holes and crannies under a mass of overhanging roots in the ravine east of the town, a curious-looking bird which I recorded in my diary at the time as being like a chocolate-colored, tailless Carolina wren. I had only my insect net and could not secure it. Imagine my surprise when, on July 2, five years later, I saw under a heap of brush, within ten feet of the original spot, another specimen of the same bird. This one I secured. It crept about slowly among the roots and twigs, did not use its wings, and moved more like a mouse than a bird.

This individual does not agree with any of the described species, although it appears to be related to *M. squamulatus* of Sclater and Salvin. It is, however, not nearly so white below, and the colors of the upper parts are darker, judging from the plate.¹

It may be described as follows: Type, female adult, No. 175251, U.S.N.M.; La Guaira, July 2, 1900; Wirt Robinson, collector's No. 1451. Above Mars brown, uniform on back, rump, and upper tail-coverts, but feathers of head with slightly darker centers; tail and wing quills clove brown, some of the latter bordered with the color of the back. Wing-coverts like the back, some of the innermost greater coverts with minute russet spots. Throat white, the lower part finely and rather indistinctly barred with grayish brown; sides of head and foreneck drab, feathers of the latter part tipped with wood brown; sides of breast, flanks, under tail-coverts, and abdomen mummy brown, more inclining to Prout's brown on the latter; the flanks and under tail-coverts with more or less indistinct blackish bars; center of the breast, Prout's brown with V-shaped and U-shaped grayish white markings; under wing-coverts wood brown. Bill and feet blackish in the dried skin, basal part of mandible paler. Wing, 57; tail, 20; tarsus, 23; culmen, 19 millimeters.

Family SYLVIIDÆ.

82. POLIOPTILA PLUMBICEPS Lawrence.

LAWRENCE'S GNAT CATCHER.

Common in the scrub of the dry coast lands.

Family TURDIDÆ.

83. ? MERULA FUMIGATA Lichtenstein.

SABIAN THRUSH.

One young bird, obtained at San Julián July 17, agrees more nearly with *M. fumigata* than with any other species.

¹ Proc. Zool. Soc. Lond., 1875, pl. vi.

AN ANNOTATED LIST OF BATRACHIANS AND REPTILES
COLLECTED IN THE VICINITY OF LA GUAIRA, VENE-
ZUELA, WITH DESCRIPTIONS OF TWO NEW SPECIES
OF SNAKES.

By LEONHARD STEJNEGER,
Curator, Division of Reptiles and Batrachians.

The collections here reported upon were made in 1895 by Captain Robinson, and in 1900 by Messrs. Robinson and Lyon jointly.

For detailed information relating to their trips, the localities visited, etc., the reader is referred to the introductory remarks by the collectors in their paper on the mammals, pages 135 to 162 of this volume.

I. BATRACHIA.

ECAUDATA.

PHYLLOBATES TRINITATIS Garman.

Garman's original description¹ fits the two specimens from Venezuela and contains nothing by which I can separate them. In the specimens before me the tibio-tarsal articulation reaches to the anterior border of the orbit; first finger is shorter than second; there is a large metacarpal pad, and two metatarsal tubercles, the inner one being almost as long as the diameter of the largest digital disk, though narrower; on the lower half of the tarsus a very distinct fold, which is a continuation of the lateral narrow fringe of the inner toe, extending from the base of the latter obliquely across the underside of the tarsus to the median line. The blackish lateral band is very broad between shoulder and groin, and semidivided lengthwise by a whitish line extending forward somewhat obliquely from the groin; a blackish longitudinal streak on anterior face of upper arm. The dusky band across the chest is not well marked in No. 27808.

With the latter there are 11 tadpoles, which adhered to its back when caught.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.	Remarks.
27792	7	La Guaira	July 2, 1900	With tadpoles.
27808	43	San Julian	Aug. 8, 1900	

¹ Bull. Essex. Inst. XIX, 1887, p. 13.

LEPTODACTYLUS OCELLATUS (Linnæus).

In both specimens the tarsal fold is quite distinct.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.
22539	A3	La Guaira	June 22, 1895
27793	16	do	July 8, 1900

Captain Robinson writes regarding specimen No. 22539:

Common. Taken in acequia near the town. This frog makes a noise like the sound of water gurgling from a bottle, only it is a single note and louder. They make in the weeds in the water's edge a "bird's nest" of bubbles, or rather more like the whipped-up white of eggs and even more glutinous. The depression in the center goes entirely through, and the frog sits in the water below, with its nose and eyes appearing in the bottom of the nest.

BUFO MARINUS (Linnæus).

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.
22537	A5	La Guaira	June 22, 1895
22538	A4	do	do.
27796	6	do	July 2, 1900
27800	21	do	July 15, 1900
27801	22	do	do.
27802	20	San Julian	July 20, 1900
27803	24	La Guaira	July 15, 1900
27804	26	do	do.
27805	25	do	do.
27806	23	do	do.
27807	29	San Julian	July 20, 1900

According to Captain Robinson this species is common and well known under the name "Sapo," the Spanish word for toad. Their eggs are laid in long glutinous cords.

HYLA VENULOSA (Laurenti).

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.
22545	A6	La Guaira	June 22, 1895
27797	8	do	July 3, 1900

Captain Robinson's remarks about No. 22545 are as follows:

Taken swimming in the acequia. I was attracted to it by its loud, monotonous note like the bleating of a goat, and fully as loud. It was heard a long distance. On each side of its head it has a sac which can be largely inflated, and which were so inflated when the animal was caught.

HYLA CREPITANS Wied.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.
22541	A52	La Guaira	July 24, 1895
22542	A30	do	June 26, 1895
22543	A10	do	June 22, 1895
22544	A22	do	June 24, 1895
27791	17	do	July 10, 1900
27794	4	do	July 2, 1900
27795	5	do	do.

According to Captain Robinson, Nos. 22541 to 22544 were caught on upper surface of large green leaves overhanging water. No. 22542 was colored light buff above, below orange. No. 22543, which is much smaller, was very pale green with whitish eyes.

II. REPTILIA.

SAURIA.

GONATODES VITTATUS (Lichtenstein).

No. 27820 has a white, black-margined dorsal band and black converging lines on throat, exactly as Dr. Werner describes a specimen from Trinidad.¹ The other is uniformly drab above, with large, rounded, black and pale spots, which are smaller and less pronounced on head and extremities. There are also some dusky lines in front of and behind the eyes; underside uniform whitish.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.
27819	27	San Julian	July 19, 1900
27820	26	do	do.

THECADACTYLUS RAPICAUDA (Houttuyn).

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.
22514	A 26	La Guaira	June 25, 1895
22515	A 29	do	June 26, 1895
27790	11	do	July 5, 1900

According to Captain Robinson's notes, the first two specimens were caught in a damp and dark gorge, clinging to the bare trunks of large trees. He adds that they change color to suit the background.

¹ Verh. Zool. Bot. Ges. Wien, 1900, p. 263.

ANOLIS CHRYSOLEPIS Duméril and Bibron.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.
22522	A 16	La Guaira	June 23, 1895
22523	A 17	do	do.
22524	A 18	do	do.
22525	A 20	do	do.
27818	20	do	July 12, 1900

The distended dewlap is "red," as noted by Captain Robinson. His specimens were caught in small bushes with the butterfly net.

IGUANA IGUANA (Linnæus).

The specimens are perfectly typical, showing no tendency toward *I. rhinolophus*. In the only two specimens with well-developed dorsal spines, viz, Nos. 22516 and 27817, the number of spines between their origin on the nape and the level of the vent is 56 and 59, respectively.

List of specimens.

U.S.N.M. No.	Sex.	Collector's No.	Locality.	When collected.
22516	Female...	A 24	La Guaira	June 25, 1895
22517	.....	A 11	do	June 22, 1895
27817	Male	18	do	July 10, 1900
27827	.....		Rio Chico.....	
27828	.....		.....do	

POLYCHRUS MARMORATUS (Linnæus).

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.
27783	10	Macuto	July 5, 1900
27784	14	Cucuruti	July 7, 1900
27785	15	do	do.

PLICA PLICA (Linnæus).

Boulenger has followed Gray in applying "*Uraniscodon* Kaup" to the present genus, a course not warranted by the history of the case, which is as follows:

In 1825 Kaup¹ plainly based his *Uraniscodon*, as he then wrote it, on *Agama superciliosa*, though including both *L. plica* and *umbra* in the genus. These species were excluded by Boie a few months later,² and the amended name *Uraniscodon* restricted more emphatically to *A. superciliosa*. This fixes the latter as the type, and the subsequent application of *Uraniscodon* to the present genus is inadmissible. On the contrary, the genus which Boulenger credits to Fitzinger as "*Ophryoesa*," 1826 (though spelled by Fitzinger *Ophryessa*), must henceforth be known as *Uraniscodon* Kaup, 1825.

¹ Isis, 1825, p. 590.² Isis, 1825, p. 1090.

Fitzinger's *Ecpymotes*, which he established in 1826 without indicating a type, might have been applicable to the present genus, as it embraced nominally both species which Boulenger now includes in it, but in 1843¹ he clearly indicates the type to have been a young specimen of *Polychrus marmoratus*, of which genus it thus becomes a synonym.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.
27798	9	La Guaira	July 3, 1900
27799	13	do	July 5, 1900

AMEIVA AMEIVA (Linnæus).

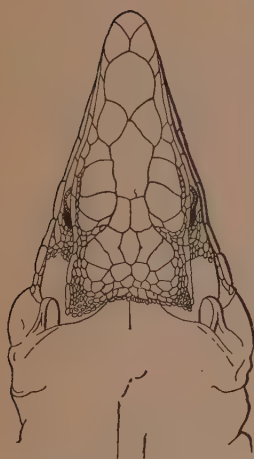


FIG. 1.—AMEIVA AMEIVA, × 2.

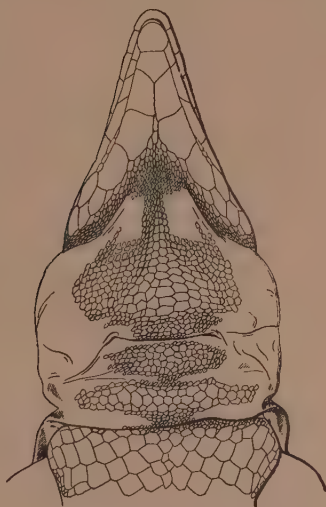


FIG. 2.—AMEIVA AMEIVA, × 2.

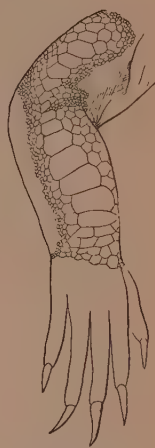


FIG. 4.—AMEIVA AMEIVA, × 2.

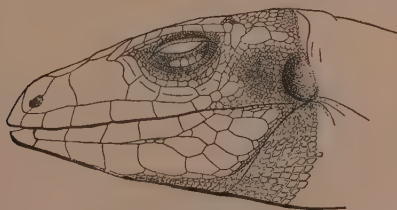


FIG. 3.—AMEIVA AMEIVA, × 2.

¹Syst. Rept., pp. 61-62.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.
22526	A 25	La Guaira	June 25, 1895
27787	3	do	July 2, 1900
27788	12	do	July 5, 1900

This species, according to Captain Robinson, is common at La Guaira, where it is known as the "mato." He describes the color of the living animal (No. 22526) as follows: Head, brown above; chin and throat, black; center of back, bronze green. Lives in burrows, and has a habit of licking out its forked tongue like a snake.

CNEMIDOPHORUS LEMNISCATUS (Daudin).*List of specimens.*

U.S.N.M. No.	Collector's No.	Locality.	When collected.
22528	A 1	La Guaira	June 21, 1895
22529	A 8	do	June 22, 1895
27786	2	do	July 2, 1900
27809	31	do	July 25, 1900
27810	33	do	do.
27811	32	do	do.
27812	27	do	July 15, 1900
27813	37	do	July 25, 1900
27814	34	do	do.
27815	36	do	do.
27816	35	do	do.
27829		Rio Chico	
27830		do	

FIG. 5.—AMEIVA AMEIVA,
× 2.

Captain Robinson's notes contain the following description of the living animal (No. 22528):

Head, neck, front legs, and portions of hind legs "birds'-egg" blue; flanks golden green; back of head and back brownish, with fine lighter stripe, then darker; tail greenish; iris bright yellow. He adds that this is by far the commonest lizard on the Venezuelan coast. It runs with great rapidity. During the halts, after its little darts, it has the habit of nervously patting one of its fore feet as if in a hurry to make another start.

SERPENTES.**BOA RUSCHENBERGII (Cope).**

The generic name *Boa* must be retained for the genus afterwards known as *Corallus* Daudin (1803), while *Constrictor* must be used for the group ordinarily designated as *Boa*, as will be seen from the following analysis.

In 1758 Linnaeus established the genus *Boa*, in which, among other species, he included *B. canina*, *B. constrictor*, and *B. ophioides*. Of course he indicated no generic type, which must therefore be ascertained by the process of elimination. In 1768 Laurenti subdivided the genus into two genera, for one of which he retained the name *Boa*, proposing *Constrictor* for the other. *Boa* he made to contain three nominal species, but they all belong as synonyms to Linnaeus's *B. canina*, which, therefore, must stand as the type. *Constrictor*, on the other hand, contains the two other Linnean species mentioned above (the additional *B. divinogurus* being only a synonym of *B. ophioides*).

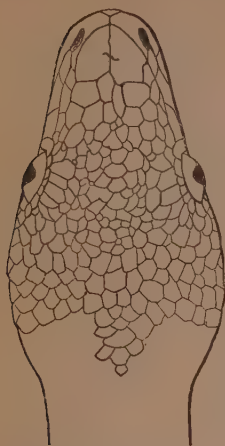


FIG. 6.—*BOA RUSCHENBERGII*, $\times 1\frac{1}{2}$.

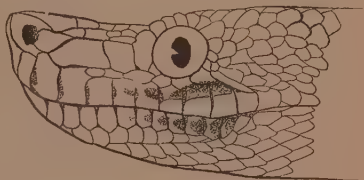


FIG. 7.—*BOA RUSCHENBERGII*, $\times 1\frac{1}{2}$.

The case is as plain as it can possibly be, and the well-known *Boa constrictor* must henceforth be known as *Constrictor constrictor*.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.	Scales.	Ventrals.	Subcaudals.
27832	-----	Río Chico -----	-----	43	260	109

PHRYNONAX LYONI, new species.

Diagnosis.—Scales in 23 rows, smooth except three median ones which are feebly keeled; ventrals 199; anal 1; subcaudals 111 pairs; preocular well separated from the frontal; eight upper labials, posterior very long; interparietal suture equals length of frontal as well as the distance of the latter from tip of snout.

Type.—Cat. No. 27826, U.S.N.M.; Macuto, Venezuela; August 4, 1900; M. W. Lyon, jr., collector.

Habitat.—Venezuela.

Description of type specimen.—Rostral much broader than deep, visible from above; internasals slightly shorter than prefrontals; frontal much longer than broad, as long as its distance from the tip of the snout, and as long as the interparietal suture; parietals as long as frontal and half the interprefrontal suture; loreal as long as deep; one preocular, not in contact with frontal; two postoculars; temporals 2 + 2; eight supralabials, fourth, fifth, and sixth entering eye, eighth

very long; six lower labials (seven on left side) in contact with anterior chin-shields, which are slightly shorter than posterior; scales in 23 rows, smooth except three median rows which are feebly keeled; two

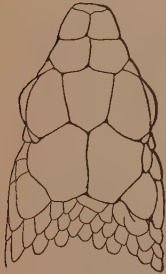


FIG. 8.—*PHRYNONAX LYONI*, $\times 1$.

apical pits; ventrals 199, distinctly angular laterally; anal entire; subcaudals 111 pairs. Black above, each scale with a yellowish spot, without forming any stripes or definite pattern; throat and anterior third of under side white (in alcohol) with a narrow black edge on each side of the ventrals from about the thirty-eighth ventral, these black edges becoming broader posteriorly, so as to finally occupy the whole of the ventrals with the exception of two pale lateral spots; head above black, each plate with a few yellowish spots; supralabials yellowish (white in alcohol), the black of the sides of the head invading the upper edge angularly, but vertical sutures not blackened.



FIG. 9.—*PHRYNONAX LYONI*, $\times 1$.

Total length, 1,085 mm.; tail, 270 mm.

Remarks.—*Phrynonax lyoni* appears to be allied to *P. guentheri*, from Mexico, from which it differs chiefly in the



FIG. 10.—*PHRYNONAX LYONI*, $\times 1$.

fewer supralabials and the longer parietals. The coloration is quite similar, black with yellow spots, but there are no regular longitudinal stripes on the body or on the tail, and the sutures of the supralabials are not marked with black.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.	Scales.	Ventrals.	Anal.	Subcaudals.
27826	38	Macuto.....	Aug. 4, 1900	23	199	1	111/111

DRYMOBIUS BODDAERTII (Sentzen).

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.	Scales.	Ventrals.	Anal.	Subcaudals.
22535	A 7	La Guaira	June 22, 1895				
27822	37	Macuto.....	Aug. 2, 1900	17	182	1/1	106/106

Color of No. 22535 given by Captain Robinson as brownish with obscure lighter stripes; iris reddish brown. Shot on edge of acequia.

LEPTOPHIS AHÆTULLA (Linnæus).



FIG. 11.—LEPTOPHIS AHÆTULLA, $\times 1\frac{1}{2}$.

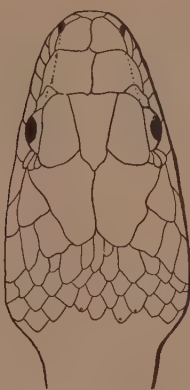


FIG. 12.—LEPTOPHIS AHÆTULLA, $\times 1\frac{1}{2}$.



FIG. 13.—LEPTOPHIS AHÆTULLA, $\times 1\frac{1}{2}$.

Both Lœnnberg and Andersson, from examination of the Linnean type specimens, have come to the conclusion that the species often known as *L. biocercus* (Wied) is the true *Coluber ahætulla* of Linnæus.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.	Scales.	Ventrals.	Anal.	Subcaudals.
27821 27831	39	Maento Río Chico	Aug. 8, 1900	15	164	1/1	134/134

CLELIA DOLIATA (Duméril and Bibron).



FIG. 14.—CLELIA DOLIATA, $\times 2$.

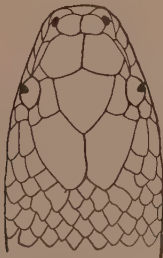


FIG. 15.—CLELIA DOLIATA, $\times 2$.



FIG. 16.—CLELIA DOLIATA, $\times 2$.

As Fitzinger in plain words indicated Daudin's *Coluber clelia* as the type of his new genus *Clelia* there can be no excuse for the retention of Wagler's *Oxyrhopus* which is four years younger. I may add here

that it appears preferable to separate the groups of species with undivided subcaudals as a distinct genus, for which Schneider's *Pseudoboa* is available.¹

The specimen before me is in most excellent condition and shows the original coloration to perfection. The anterior six black crossbars are broader than the light interspaces, which are white with black tip to each scale; all the following interspaces are broader than the black bars, being

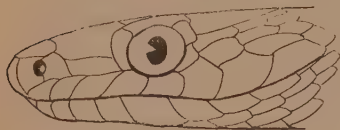


FIG. 17.—*CLELIA SEMICINCTA*, × 2.

bright red, with the row adjoining the black bars pure white and all tipped with black; the black bars on neck and body (29) invade the ends of the ventrals, while those on the tail (15) are continuous across the underside, forming complete rings; black on top of head reaches to the posterior third of the parietals; first black crossbar begins on the fifth scale behind the parietals. This specimen agrees in every particular with the two enumerated by Boulenger as "B"² and has the identical scale formula. It differs, consequently, from the type specimens described by Duméril and Bibron, and from Boulenger's specimen A, in which the majority of the black bands form more or less complete annuli. It is

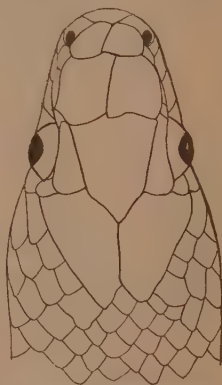


FIG. 18.—*CLELIA SEMICINCTA*, × 2.



FIG. 19.—*CLELIA SEMICINCTA*, × 2.

also to be noted that the two specimens of the latter group have 191–199 ventrals and 61–65 subcaudals, while in the former the ventrals are 183–186 and caudals 77–80. The exact locality of the type specimen is not known, nor that of the three specimens in British Museum. On the other hand, Dr. Boettger³ records two specimens of *Oxyrrhopus doliaatus* from Santa Ana, Province Cuzco, Peru, without giving particulars as to coloration and scale formula. Under the circumstances it is impossible to say whether the differences indicated above are of specific significance, which, in view of the geographical distribution, would certainly seem to be the case, if the Peruvian specimens should be found to agree with the type

of *C. doliaata* and with specimen A in British Museum.

It should be noted in this connection that the type of Cope's *Oxyrr-*

¹ Schneider, Amph., II, 1801, p. 281. The type, by elimination, is *P. coronata*.

² Cat. Snakes Brit. Mus., III, 1896, p. 106.

³ Kat. Schlangen Mus. Senckenb., 1898, p. 97.

rhopus doliatus semicinctus (Cat. No. 28900, U.S.N.M., Costa Rica, Gabb, collector) (figs. 17-19) is colored like the Venezuelan specimen so far as the underside is concerned, the bars on neck and body numbering 25 and the rings on tail 13, but the dark bars and rings throughout are broader than the light interspaces, which are not regularly spotted with black; the black bars anteriorly often alternate and coalesce broadly on the median line. The scale formula differs also considerably from those mentioned above, being as follows: Scale rows, 19; ventrals, 200; anal, 1; subcaudals, 90/90.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.	Scales.	Ventrals.	Anal.	Subcaudals.
27823	44	La Guaira....	Aug. 11, 1900 ..	19	184	1	79/79

PSEUDOB OA NEUWIEDII (Duméril and Bibron).



FIG. 20.—PSEUDOB OA NEUWIEDII, $\times 2\frac{1}{2}$.

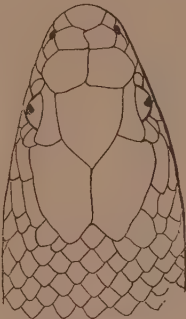


FIG. 21.—PSEUDOB OA NEUWIEDII, $\times 2\frac{1}{2}$.

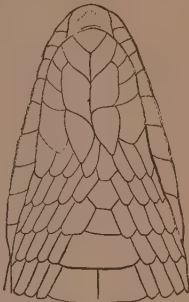


FIG. 22.—PSEUDOB OA NEUWIEDII, $\times 2\frac{1}{2}$.

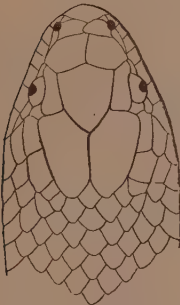


FIG. 24.—PSEUDOB OA NEUWIEDII, $\times 2$.



FIG. 23.—PSEUDOB OA NEUWIEDII, $\times 2$.

The specimen from La Guaira differs from two from Trinidad in having a wide, white band across occiput, as in young *Olebia olebia*.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When collected.	Scales.	Ventrals.	Anal.	Subcaudals.
27824	19	La Guaira....	July 10, 1900 ..	19	182	1	89

PSEUDOB OA ROBINSONI, new species.

Diagnosis.—Scales in 19 rows; ventrals, 186; anal single; subcaudals, 82, single; posterior nasal and loreal widely separated by second labial which is broadly in contact with prefrontal; rostral prominent, slightly upturned, broader than deep, the portion visible from above one-half as long as its distance from the frontal; supralabials eight.



FIG. 25.—PSEUDOB OA ROBINSONI, $\times 1\frac{1}{2}$.

Type.—Cat. No. 22532 U.S.N.M.; La Guaira, Venezuela; June 21, 1895; Capt. Wirt Robinson, collector.

Habitat.—Venezuela.

Description of type specimen.—Eye rather small; snout projecting; rostral large, prominent, slightly upturned, broader than deep, its upper portion forming an obtuse angle and measuring one-half its distance from the frontal; internasals slightly shorter than prefrontals; frontal much longer than broad, equally its distance from tip of snout and longer than interparietal suture; parietals as long as frontal and one-half the interprefrontal suture; loreal small, much longer than deep, broadly separated from posterior nasal; one preocular scarcely reaching the upper surface and widely separated from frontal; two postoculars; 2 + 3 temporals, the upper one of the first row only in contact with postoculars; eight supralabials, second broadly in contact with prefrontal and sixth in contact with upper anterior temporal, fourth and fifth entering eye; four lower labials in contact with anterior chin-shields, which are slightly longer than the posterior; scales smooth, in 19 rows, with two

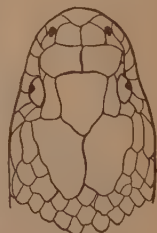


FIG. 26.—PSEUDOB OA ROBINSONI, $\times 1\frac{1}{2}$.



FIG. 27.—PSEUDOB OA ROBINSONI, $\times 1\frac{1}{2}$.

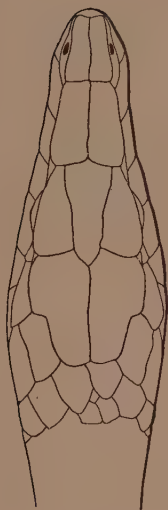
terminal pits; ventrals, 186; anal single; subcaudals, 82, single; color (in alcohol), above, uniform drab, becoming paler on the three lower scale rows; top of head and a spot on upper neck behind occiput darker; underside, including upper labials, uniform whitish.

Total length, 700 mm; tail, 175 mm.

Remarks.—*Pseudoboa robinsoni* in some respects occupies an intermediate position between *P. newwiedii* and *P. guerini*, having a snout more projecting than the former, but less so than the latter, though the portion of the rostral visible from above is not greater than in *P. newwiedii*. It differs from both most strikingly in the separation of the loreal from the posterior nasal, the second supralabial thus coming broadly in contact with the prefrontal.

List of specimens.

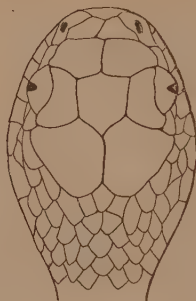
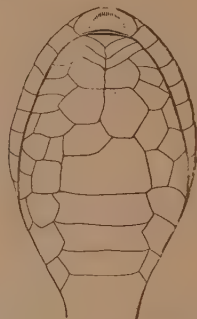
U.S.N.M. No.	Collector's No.	Locality.	When col- lected.	Scales.	Ventrals.	Anal.	Subcau- dals.
22532	A 2	La Guaira	June 21, 1895	19	186	1	82

OXYBELIS ACUMINATUS (Wied).FIG. 28.—OXYBELIS ACUMINATUS, $\times 2$.FIG. 29.—OXYBELIS
ACUMINATUS, $\times 2$.FIG. 30.—OXYBELIS
ACUMINATUS, $\times 2$.*List of specimens.*

U.S.N.M. No.	Collector's No.	Locality.	When col- lected.	Scales.	Ventrals.	Anal.	Subcau- dals.
22536	A 28	La Guaira	June 26, 1895	17	182	2	166/166
27825	30	San Julian.....	July 21, 1900				

Captain Robinson writes that this snake in crawling carried from one-third to one-half of its body erect in the air. It was killed on the ground.

LEPTOGNATHUS VARIEGATUS Duméril and Bibron.

FIG. 31.—LEPTOGNATHUS VARIEGATUS, $\times 3$.FIG. 32.—LEPTOGNATHUS VARIEGATUS, $\times 3$.FIG. 33.—LEPTOGNATHUS VARIEGATUS, $\times 3$.

The specimen collected by Captain Robinson has fewer supralabials than the normal number credited to this species. In view of the great variability of this character, and also because the present specimen is manifestly abnormal on the left side, I have not attached any importance to this circumstance. On the left side there are only eight supralabials, nevertheless the third is excluded from the eye, which is only in touch with the fourth and fifth. On the right side the number of supralabials is nine, third, fourth, and fifth entering the eye. Nasal is apparently undivided.

List of specimens.

U.S.N.M. No.	Collector's No.	Locality.	When col- lected.	Scales.	Ventrals.	Anal.	Subcau- dals.
22531	A 15	La Guaira	June 23, 1895	15	179	1	81/81

Captain Robinson writes that this snake was coiled up in a tight knot at the end of a twig on a small bush. A blow from the handle of his butterfly net killed it, but it hung until taken down.

CHELONIA.

TESTUDO DENTICULATA Linnæus.

Four live specimens of this common South American land tortoise were brought home and deposited in the National Zoological Park.

The collectors state that these turtles are eaten by natives, who call them *morocoys*.

ON A STONY METEORITE, WHICH FELL NEAR FELIX, PERRY COUNTY, ALABAMA, MAY 15, 1900.

By GEORGE P. MERRILL,
Head Curator, Department of Geology.

The meteorite here described fell about 11.30 a. m. on May 15, 1900, near Felix, Alabama. For the details concerning the fall, as well as for securing the specimen itself, the United States National Museum is indebted to Mr. J. W. Coleman, who visited the locality and obtained the statements of eyewitnesses. These statements, somewhat abridged, are as follows:

Mr. Robert D. Sturdevant, a farmer of Augustin, Perry County, said that while at work in his cotton field his attention was attracted by a loud rumbling noise sounding very much like thunder. It being a clear, cloudless day, he immediately looked up and saw the meteorite directly overhead. There was one very loud report, followed by two lesser ones, the appearance being compared to that of "a big piece of red-hot iron being struck with a hammer, causing many sparks to fly in all directions. After the explosion the smaller pieces popping off sounded much like a small stone or nail being thrown with great force, making a humming or hissing noise. The meteor seemed to be passing from east to west."

The main mass of the stone, weighing about 7 pounds, was subsequently brought by a colored boy to Mr. Sturdevant, who visited the locality, about half a mile away, and found that in falling it had made a hole about 6 inches deep in the soft plowed ground.

Mr. Robert S. Browning, who was on Mr. Sturdevant's place at the time of the fall, stated that, "There was a rumbling noise, followed by three loud reports much like thunder or a big gun." He compared the appearance of the meteorite to that of "a big shovel of red-hot coals being upset."

Mr. W. A. Kenan, of Benton, Alabama, some 25 miles from the place where the stone was found, stated that the report was heard in Selma,

Montgomery, and Marion, the latter place being about 16 miles west of Augustin.

So far as can be learned—a part of the information being obtained by Mr. Coleman from negroes—the stone at the time of the explosion broke into three pieces, the larger of which was the one brought to Mr. Sturdevant and which is said to have originally weighed about 7 pounds, as already noted. Another small piece was found, but has disappeared, and the third, if such there was, was never found. The stone, as obtained by Mr. Coleman, was broken into five pieces which weighed altogether 2,049 grams. As shown in the illustration (Plate XIII), it was about 13 centimeters in its greatest length, by 9 in breadth, and about the same thickness, and was covered except where broken, by a very thin black crust, nowhere more than half a millimeter in thickness. The color on the broken surfaces is dark smoky gray, almost black. It is very fine grained, with numerous small dark chondrules, not more than 1 to 2 millimeters in diameter at most, and with no metallic iron visible to the naked eye. The mass is quite soft and friable and resembles in a general way the stones of Warrenton, Warren County, Missouri, and Lancé, France, more closely than those of any other locality with which the author is acquainted.

The color is, however, darker than is the Warren County stone, and the chondritic structure more pronounced than in that of Lancé. It is, moreover, uniformly gray in color, and not speckled with white, as is the last named. Under the microscope the stone is seen at once to belong to the chondritic type, as is indeed evident on close inspection by the naked eye. The essential minerals are olivine, augite, and enstatite, with troilite and native iron, the silicates occurring in the form of chondrules, or associated more or less fragmental particles, embedded in a dark, opaque, or faintly translucent base, which is irresolvable so far as the microscope is concerned. The structure is pronouncedly fragmental and the stone belongs, beyond question, to the group of tuffs.

The details of the microscopic structure are as follows: In a very dense, dark gray, seemingly amorphous base are scattered various silicate minerals in the form of fragments and chondrules, and interspersed with occasional minute blebs of native iron and troilite. The chondrules are composed of olivine, enstatite, or augite, and are sometimes monosomatic and sometimes polysomatic, holocrystalline, or with a varying amount of glassy base. Interspersed with these are fragments of olivines and enstatites of all sizes, from a half a millimeter down to the finest dust. Scattered through the ground mass are proportionally large plates or clusters of enstatites, as shown in Plate XIV, fig. 1. These are very light gray in color, with poorly defined outlines and extremely irregular borders projecting into the black

irresolvable material which forms the base. The enstatite chondrules are in some cases almost completely amorphous or cryptocrystalline. Fig. 2 of Plate XIV shows an impure nucleal mass surrounded by a clear transparent border of the same material. In this case the chondrule extinguishes in polarized light as a unit, and the general appearance is remarkably like that of the quartz granules which have undergone secondary enlargement in sandstones.¹

Many of the augites show polysynthetic twinning such as was noted by Tschermak in the meteorites of Renazzo and Mezo Madras, as do also, according to the present writer's observation, those of the meteorite of Warrenton, Warren County, Missouri. The banding is in some cases so regular and the colors so light that it was at first thought such might be in part plagioclase feldspars. The forms are, however, those of augite; they lack the pellucidity of feldspars, and, moreover, sections of the mineral showing no twinning bands always extinguish parallel with the vertical axes, while those showing twinning bands give extinctions as high as 39 degrees. There is, therefore, apparently no doubt of their augitic nature. (See Plate XIV, fig. 2.)

The most striking features of the stone are the extremely irregular, almost amorphous, areas shown in figs. 4, 5, and 6 of the same plate. These seem in a general way to resemble the amorphous chondrules described by Tschermak from the meteorite of Grosnaja and figured on Plate 20, fig. 2 of his *Mikroskopische Beschaffenheit der Meteoriten*. They present, however, certain features such as suggest quite a different origin.

In fig. 4 the outlines are very jagged, sharp crystal points projecting into the black ground mass and the whole made up of an extremely fine aggregate of nearly colorless, faintly polarizing granules interspersed with a few black spots. Fig. 5, on the other hand, is that of a nearly amorphous or faintly cryptocrystalline mass. Fig. 6, which is one of the most striking, shows a distinctly crystalline border with an interior crystalline aggregate merging outward into cryptocrystalline matter, as in the last case. The border, as shown when the body is viewed between cross nicols, belongs to a different and probably earlier stage of crystallization than the interior, and were the rock a terrestrial tuff, I think beyond question a majority of petrographers would regard the entire aggregate as secondary, and as due to a deposit in a preexisting cavity through infiltration of solutions. The exact character of the mineral comprising these areas can not with certainty be

¹ Tschermak described a like border in the chondrules of the meteorite of Grosnaja. He accounted for it by supposing it to be of secondary origin, a product of a second rise in temperature (accompanied it may be reducing vapors) not sufficient to produce fusion, but merely to bring about a structural modification in the superficial portions. (Min. u. Pet. Mittheil. I, 1878, p. 160.)

made out. It is colorless, polarizes in light and dark shades only, shows no satisfactory crystal outlines or cleavage, and in but one instance was I able to get what was apparently one of the bars of a biaxial interference figure. They are perhaps feldspathic. Their small size (the entire aggregate in fig. 6 being only some four-tenths of a millimeter in diameter) renders their separation for microchemical tests practically impossible.

Others of these areas are so finely cryptocrystalline and merge so gradually into the ground mass that it is scarcely possible to consider them as mechanically included fragments.

The chemical composition of the stone is shown in the analyses given below, as made in the laboratory of the department by Dr. Peter Fireman.

By treatment with solution of the double salt of mercuric ammonium chloride, after the method of Carl Friedheim,¹ there was obtained:

	Per cent.
(a) Metallic portion.....	3.04
(b) Nonmetallic portion (including troilite and chromite).....	96.96
	100.00

The metallic portion yielded:

	Per cent.
Fe	85.04
Ni	11.93
Co	2.79
Cu	0.24
	100.00

The silicate portion was digested with hydrochloric acid and sodium carbonate solution after the usual method. The soluble and insoluble portions then yielded results as below, deducting those constituents present in combination, as troilite, chromite, or as free carbon.

<i>Soluble silicate.</i>		<i>Insoluble silicate.</i>	
	Per cent.		Per cent.
SiO ₂	32.91	SiO ₂	53.59
Al ₂ O ₃	2.73	Al ₂ O ₃	6.97
FeO	34.74	FeO	3.50
MnO	0.94	CaO	4.33
NiO & CoO	1.39	MgO	31.33
CaO	6.43	K ₂ O	0.34
MgO	19.39	Na ₂ O	0.63
K ₂ O	0.11		
Na ₂ O	0.70		100.69
H ₂ O at 110°	0.22		
	99.56		

¹Sitz. d. k. Preuss. Akad. der Wissenschaft 1888, p. 345.

From these analyses the total chemical composition of the entire stone was calculated as follows:

Fe	2.59	} Metallic portion=3.04 per cent.
Ni	0.36	
Co	0.08	
Cu	0.01	
SiO ₂	33.57	} Stony portion=96.96 per cent.
Al ₂ O ₃	3.24	
Cr ₂ O ₃	0.80	
FeO	26.22	
FeS	4.76	
MnO	0.68	
NiO & CoO	1.01	
CaO	5.45	
MgO	19.74	
K ₂ O	0.14	
Na ₂ O	0.62	
C (Graphite)	0.36	
H ₂ O at 110°	0.16	
	99.79	

Specific gravity, at 30° c, as determined by Mr. Tassin, 3.78.

The mineralogical composition may therefore be given as follows:

	Per cent.
Metal	3.04
Troilite	4.76
Chromite	1.17
Graphite	0.36
Soluble silicate (olivine in part)	72.60
Insoluble silicate (enstatite and augite in part)	18.07
	100.00

There are certain points of these analyses which I am unable, at present, to satisfactorily explain. The insoluble portion may be considered as essentially enstatite and an aluminous monoclinic pyroxene, and the soluble portion as largely olivine. But the high per cent of iron protoxide (FeO) as well as the lime and alumina in this latter portion, are not easily accounted for. It is possible that the last two elements may be constituents of the colorless, undetermined mineral referred to, but the source of the iron protoxide is for the present unexplainable.

The case is, however, not without precedent, J. Lawrence Smith reporting¹ similar conditions in the Warrenton, Warren County, Missouri, stone, which, however, he allows to pass without comment.

¹ Original Researches in Mineralogy and Chemistry, p. 532.

For purposes of comparison, I give below the analyses of the soluble and insoluble silicate portions of the Felix and Warrenton meteorites:

Constituent.	Felix.		Warrenton.	
	Soluble silicates.	Insoluble silicates.	Soluble silicates.	Insoluble silicates.
SiO ₂	32.91	53.59	33.02	56.90
Al ₂ O ₃	2.73	6.97	0.12	0.20
FeO	34.74	3.50	37.57	10.20
MnO	0.94			
NiO	1.39		1.54	
CoO			0.31	
CaO	6.43	4.33	Trace.	7.62
MgO	19.39	31.33	28.41	22.41
K ₂ O	0.11	0.34		
Na ₂ O	0.70	0.63	0.07	1.00
	99.34	100.69	101.04	98.33

The dark color of the rock is undoubtedly due to the carbon it contains, since the amount of iron and troilite, as shown by the analyses, is extremely small. More than that, the finely pulverized rock, after having been subjected to prolonged digestion in hydrochloric acid and sodium carbonate solution, still shows minute black, amorphous, and opaque flakes distributed through it, which are presumably carbon in the form of graphite. The stone evidently belongs to Brezina's class of *Kügelchenchondrites* and to Meunier's group of *Ornanites*. It will be known as the Felix meteorite.

I am indebted to Dr. F. Berwerth, of the k. k. Hof Museum at Vienna, for a fragment of the Lancé meteorite for comparison, and to the Shepard collection for material for thin sections of the Warren County stone.

EXPLANATION OF PLATES.

PLATE XIII.

Figs. 1 and 2. Felix meteorite. The size is indicated by the centimeter rule below each figure.

PLATE XIV.

Fig. 1. Enstatite plates in ground mass. The black in this and in figs. 5 and 6 is a little too dense. It is intended to show the dark, irresolvable base.

Fig. 2. Monosomatic enstatite chondrule with clear, colorless border.

Fig. 3. Twinned augite.

Figs. 4, 5, and 6. Colorless, granular, and cryptocrystalline areas of an undetermined mineralogical nature, which it is thought may be of secondary origin. The actual size of the particles figured on this plate in no case exceeds 0.5 mm.

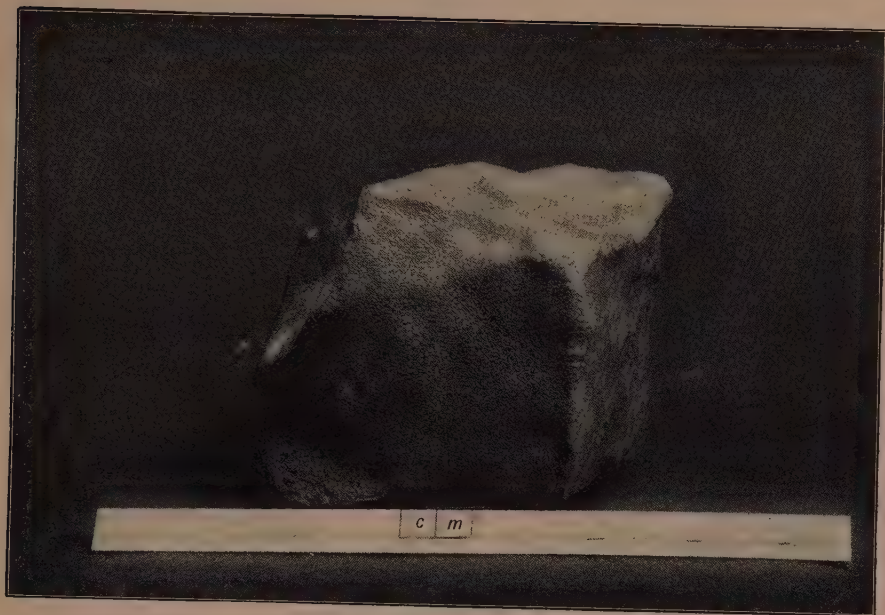


Fig. 1.

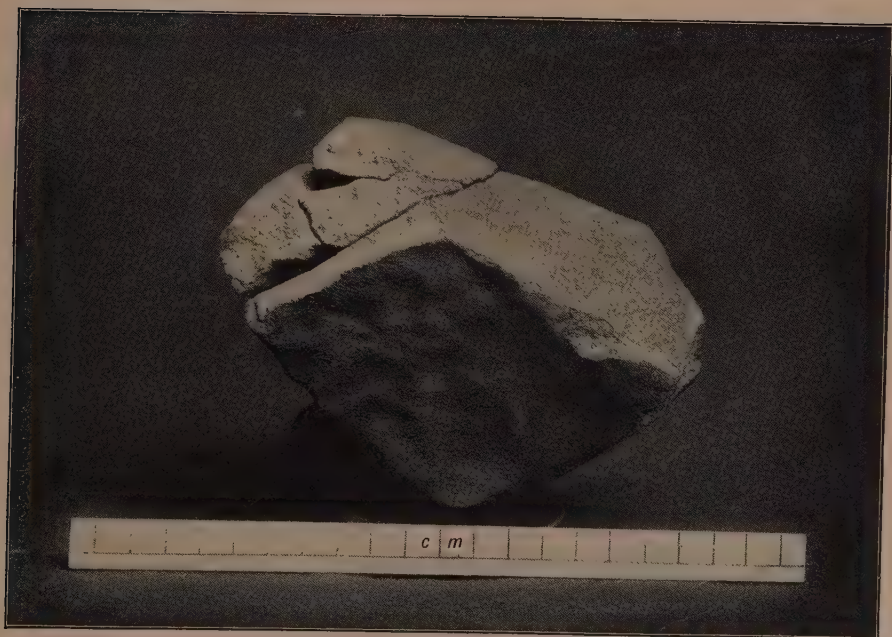


Fig. 2.

THE FELIX METEORITE.

FOR EXPLANATION OF PLATE SEE PAGE 198.

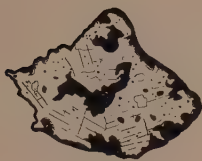


Fig. 1.



Fig. 2.

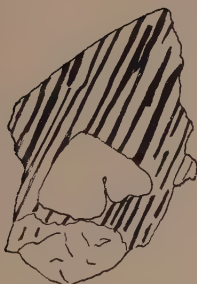


Fig. 3.



Fig. 4.



Fig. 5.

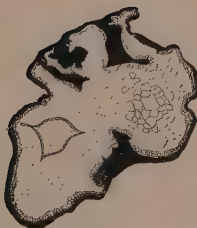


Fig. 6.

THE FELIX METEORITE.

FOR EXPLANATION OF PLATE SEE PAGE 198.

A REVIEW OF THE ATHERINE FISHES OF JAPAN.

By DAVID STARR JORDAN and EDWIN CHAPIN STARKS,

Of the Leland Stanford Junior University.

In the present paper is given an account of the Japanese species of Atherinidæ. It is based on the collections made in 1900 by Messrs. Jordan and Snyder and upon the specimens contained in the United States National Museum. The drawings are by Mrs. Chloe Lesley Starks.

Family ATHERINIDÆ.

THE SILVERSIDES.

Body rather elongate, somewhat compressed, covered with scales of moderate or small size, which are usually, but not always, cycloid. No lateral line; some scales often with rudimentary mucous tubes. Cleft of the mouth moderate. Teeth small on jaws and sometimes on vomer and palatines, rarely wanting. Premaxillaries protractile or not. Opercular bones usually without spines or serrature. Gill openings wide, the gill membranes not connected, free from the isthmus; gills 4, a slit behind the fourth. Pseudobranchiæ present; gill-rakers usually long and slender. Branchiostegals 5 or 6. Dorsal fins 2, well separated, the first of 3 to 8 slender flexible spines, the second of soft rays; anal with a weak spine, similar to the soft dorsal, but usually larger; ventral fins small, abdominal, not far back, of 1 small spine and 5 soft rays; pectorals moderate, inserted high. Air bladder present. No pyloric cæca. Vertebrae numerous, usually about $23 + 23 = 46$; third and fourth superior pharyngeals coossified, with teeth. Carnivorous fishes, mostly of small size, living in great schools near the shore in temperate and tropical seas; a few species in fresh water. All the species have a silvery band along the side; this is sometimes underlaid by black pigment. All of them which are large enough are highly valued as food.

a. Premaxillaries protractile, the skin not continuous with that of the forehead.

b. Premaxillary narrow posteriorly, its edge nearly straight.

c. Body little compressed, the belly rounded; pectorals short; scales cycloid; vomer with teeth; first dorsal with 5 or 6 spines, inserted in front of the rather short anal; mouth short.

d. Head without spines..... *Atherina*

dd. Head with rows of small sharp spines along the various ridges.

Atherion.

cc. Body much compressed, the breast compressed to a sharp edge; belly (in male) with a fleshy fold..... *Iso*

ATHERINA (Artedi) Linnæus.

FRIARS.

Atherina (Artedi) LINNÆUS, Syst. Nat., 10th ed., 1758, p. 315 (*hepsetus*).

Membras BONAPARTE, Fauna Italica, 1836 (no type indicated).

Body oblong, compressed. Mouth large, terminal, oblique; jaws about equal, their edges nearly straight; maxillary extending to the front of eye. Premaxillaries narrow posteriorly, strongly protractile. Villiform teeth in bands on jaws, vomer, and palatines. Species numerous, mostly European.

(*ἄθερινη*, the ancient name, from *ἄθρο*, a spike or arrow.)

a. Vent between the ventral fins.

b. Scales with entire edges, about 40 in number; lateral band narrow.....*woodwardi*

bb. Scales obtusely denticulate, about 45 in number; lateral band broader.....*bleekeri*

aa. Vent well behind tip of ventrals; scales 45; scales with entire edges.....*tsuruga*

ATHERINA WOODWARDI Jordan and Starks, new species.

Atherina ? *pinguis* ISHIKAWA, Prel. Cat., 1897, p. 33, Okinawa, Miyakoshima, Riukiu Archipelago, not of Lacépède.

Head $4\frac{1}{4}$ in body without caudal; depth $5\frac{1}{3}$. Eye $2\frac{2}{5}$ in head; snout 4; maxillary $2\frac{3}{5}$. Dorsal V-I, 10; anal I, 12. Scales 40, transverse 6.

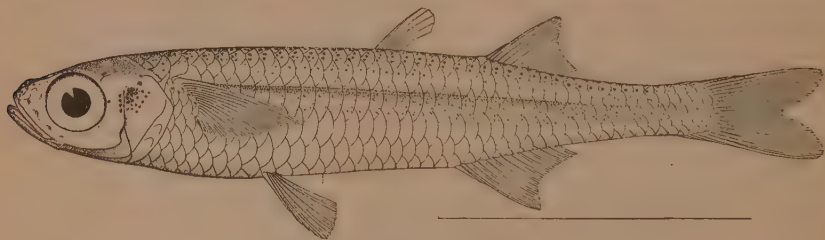


FIG. 1.—ATHERINA WOODWARDI.

Mouth moderate in size, the maxillary reaching to just past anterior orbital rim. Teeth very small, in narrow bands on jaws and vomer. Gill-rakers slender, about half eye in length, their number about 6 + 16.

Head as viewed from above essentially as here described for *A. bleekeri* and with the same ridges.

Cheeks and suborbital region evidently with scales, though but two or three scales remain on head on our specimens. Scales on body with entire edges. Fifteen scales in the median series on back before spinous dorsal, and 7 between dorsal bases.

Origin of ventrals midway between front of anal and middle of eye; distance between front of first dorsal and front of second $1\frac{2}{5}$ in head. Pectoral reaching to above first third of ventrals. Vent between ventrals as in *A. bleekeri*.

Color probably silvery; the back very sparsely covered with coarse brown dots set more or less in rows. A rather narrow silvery lateral

band bordered with black above is nearly confined anteriorly to the third row of scales below superior median series. Its posterior two-fifths being slightly wider and the scales being smaller it involves the lower edge of the second row of scales and the upper edge of the fourth; its anterior end does not show above upper edge of pectoral. Tip of snout dusky with brown dots. Opercles silvery. Another series of specimens from the same locality, probably owing to a different method of preservation, are more silvery with the lateral band not so conspicuous and with the border above it not so dark.

This species differs from *A. valenciennesi* and *A. bleekeri* in having scales with entire edges, and from the latter particularly in having fewer scales.

The type and 7 cotypes are from Okinawa, in the Riukiu group. The former bears the number 6529 on the catalogue of the Leland Stanford Junior University Museum. It was numbered 566 in the Imperial Museum of Tokyo, a type specimen being presented by Dr. Ishikawa. Others numbered 567, from Miyakoshima, are in the Imperial Museum.

The junior author wishes to name this species for Dr. Smith Woodward, of the British Museum, as a slight acknowledgment of the interest Dr. Woodward has shown in his work on fish osteology.

ATHERINA BLEEKERI Günther.

Atherina japonica BLEEKER, Verh. Bat. Gen., XXV, Japan, p. 40, fig. 2, Nagasaki, (not of Houttuyn).

Atherina bleekeri GÜNTHER, Cat. Fish., III, 1861, p. 398, China.

Atherinichthys sp. ISHIKAWA, Prel. Cat., 1897, p. 33, Ise, No. 565.

Atherina valenciennesi NYSTROM, Kong. Svensk. Ak. Vet., 1887, p. 38, Nagasaki (not of Bleeker).

Head $4\frac{1}{2}$ in body without caudal; depth $5\frac{3}{4}$. Eye 3 in head; snout 4; maxillary $2\frac{3}{4}$. Dorsal VI–I, 10; anal I, 13; scales 45; transverse series 7.

Mouth rather oblique and moderate in size; the maxillary reaching just past the anterior orbital rim; jaws about equal. Teeth very small, in bands on jaws and vomer. Gill-rakers slender, in length a little less than the diameter of pupil; about 19 present on lower limb of arch.

Nasal bones forming a ridge or angle continuous with supraorbital rim making the head as viewed from above flat, with the lateral edges straight and gradually approaching each other as a long triangle, and with the apex cut squarely off or bluntly rounded at tip of snout. Distance across tip of snout $1\frac{1}{3}$ in interorbital space, which is a little greater than diameter of eye. A broad low ridge decreasing in size anteriorly extends from the first scales on top of head to anterior interorbital edge where a depression separates it from a ridge on middle of snout formed by the process of premaxillaries. These ridges are partly formed by a depression on each side of them.

Scales on back extending over occiput to posterior margin of eyes; a few scales behind and below eye; head otherwise naked. Scales on body obtusely denticulated; fins scaleless. In a median line on back before dorsal are 20 scales, and between the bases of dorsals are 8.

Origin of soft dorsal about over the first third of anal base, the tips of its rays extending a little beyond those of anal. Origin of ventrals nearer front of anal base than tip of snout by a distance equal to diameter of eye. Pectoral reaching slightly past origin of ventrals. Origin of first dorsal before that of second a distance contained $1\frac{1}{4}$ in length of head. Vent between ventrals, midway between their tips and base.

Color.—Edges of scales of back broadly edged with blackish or dusky; this more pronounced on back as viewed from above. Top of head and tip of snout black. Tip of mandible variously dusky or colorless. Lateral band silvery, dark above; occupying nearly the entire third and upper half of fourth series of scales below median series of back. Ventrals and anal colorless. Dorsals and caudal dusky. Pectoral dusky at base.

This species is represented in great abundance in the Japanese collection. Specimens were obtained from the following localities. Tsuruga, Tokyo, Misaki, Wakanoura, island of Numata, Hakata, Nagasaki. It is everywhere common in sandy bays from Tokyo southward to Kiusiu.

Here described from a specimen $5\frac{1}{4}$ inches in length from Misaki, Sagami, Japan.

Of 16 other specimens counted, 11 have 5 spines in the first dorsal, while 5 have 6 spines. The soft dorsal varies from I, 9 to I, 10, and the anal I, 11 to I, 12.

(Named for Pieter van Bleeker.)

ATHERINA TSURUGÆ Jordan and Starks, new species.

Head $4\frac{1}{2}$ in body without caudal; depth $5\frac{3}{5}$. Eye $2\frac{3}{4}$ in head; snout $3\frac{1}{2}$; maxillary 3. Dorsal V—I, 10; anal I, 12. Scales 45; transverse series 7.

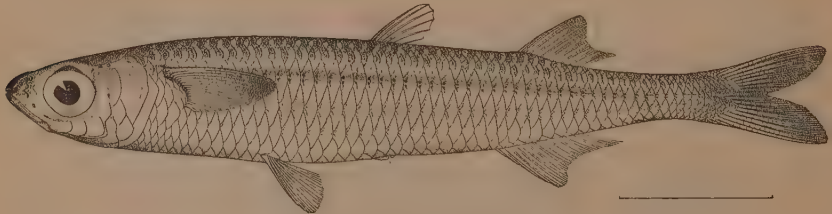


FIG. 2.—ATHERINA TSURUGÆ.

The maxillary reaches scarcely past anterior orbital rim. Jaws about equal. Teeth very small, in narrow bands on jaws and vomer. Gill-rakers slender; the longest about $2\frac{1}{3}$ in eye; their number about $6 + 21$.

The interorbital space is a little greater than the diameter of the eye. The shape of the head and the ridges are as described for *A. bleekeri*.

Scales with entire edges; their number and arrangement as in *A. bleekeri*.

Origin of soft dorsal about over the first fourth of anal. Origin of ventrals midway between front of anal and anterior orbital rim. Pectoral reaching a little past front of ventrals. Origin of spinous before that of soft dorsal a distance contained $1\frac{1}{10}$ in head.

Vent a little over half the length of ventrals posterior to the tips of those fins.

Color.—Sides silvery. Lateral band silvery bordered above with dark blue, occupying the third and part of the fourth series of scales. Top of head and a border to scales of back an opaque cobalt blue. This sometimes more or less replaced on scales by dark brown or black, but the blue is nearly always present as small dots on the median row of scales of back and may be seen by the aid of a magnifier. Pectoral dusky at tip. Ventrals and anal colorless. Dorsals and caudal dusky.

This species differs from *A. bleekeri* in having scales with entire edges, in having the top of head a conspicuous cobalt, in having the pectoral tipped with dusky, and particularly in having the vent much more posterior, which character will at once separate the species.

The type is 132 mm. in entire length and is from Nagasaki, Hizen, Japan, where many cotypes were taken. Other specimens are from Misaki and Tsuruga.

The type bears the number 6530 on the Leland Stanford Junior University Museum Register.

ATHERION Jordan and Starks, new genus.

This genus differs from *Atherina* in having small, sharp, tooth-like spines set in rows on the head. Maxillary anteriorly covered with them, a row following lower edge of mandible and another along inner under edge; these continue along interopercle and anterior part of subopercles as a band of scattered spinules; a row along lower limb of preopercle; a row on preorbital; and a row on superior orbital rim.

It also differs from the known Japanese species of *Atherina* in having the vent near front of anal.

(Diminutive of *ἄθῆρο*, the rough spike of wheat.)

ATHERION ELYMUS Jordan and Starks, new species.

Head 4 in body without caudal; depth 6. Eye 3 in head; snout 4. Dorsal V–I, 11; anal I, 16. Scales 43; transverse 7.

Mouth oblique and very small; the maxillary not nearly reaching to eye. Teeth evident on jaws, and apparently the whole roof of the mouth is granulated. Interorbital wide and convex, its width greater than diameter of eye. Top of head smooth, convex, and without

ridges. The supraorbital rim separated from central portion of interorbital space by a depression. Head with rows of small, sharp, and tooth-like spines, as described for the genus.

Opercles with three or four large scales, and cheeks and suborbital region with scales. Scales on body with entire edges. About 16 scales in the median series in front of dorsal. Second dorsal originating nearly above middle of anal, and extending a little posterior to it. Front of spinous dorsal before front of soft dorsal a distance contained $1\frac{1}{2}$ in head. Pectoral reaching to above middle of ventrals. Origin of ventrals midway between the vertical from middle of eye and front of anal. Vent near front of anal.

Color slaty, no silvery apparent except a trace at opercles. Scales



FIG. 3.—*ATHERION ELYMUS*.

of back each with a large blackish spot. Top of head and snout black. Lateral edge of lower jaw black. A black lateral stripe on third and part of fourth rows of scales, growing broader at about its middle, thence narrower at caudal peduncle and again expanding at base of caudal fin, somewhat involving base of caudal rays. Fins without color, except caudal, which is slightly dusky.

The largest specimen is 38 mm. in length. About a dozen specimens were taken in tide pools at Misaki, Sagami, Japan. The species seems to reach only a very small size.

The type here described is about 33 mm. in entire length, and is numbered 6528 on the register of the Leland Stanford Junior University Museum.

(*Elymus*, rye-grass, from the rough head: ἔλϋμος, a quiver).

ISO Jordan and Starks, new genus.

Body elongate, strongly compressed, deepest at nape, anteriorly scaleless. Breast compressed to an edge. Belly with a thick, sharp, fleshy fold of skin, at least in the male. Vertebrae about 43. Head short and blunt. Mouth small, oblique. Premaxillaries protractile but not movable. Pseudobranchiae present. The gills, except the first, which is free from the second, are separated only by a short slit at the angle. Last gill with a slit behind it. Gill-rakers slender, about $4+13$ in number. Gill membranes separate and free from the isthmus. Scales entire. First dorsal well separated from the second.

Second dorsal shorter than anal and similar to it. Caudal forked. Body with a wide black and silvery lateral band in strong contrast to body color.

(*Iso Iwashi*, surf-sardine; the Japanese name.)

ISO FLOS-MARIS Jordan and Starks, new species.

ISO-IWASHI (SHORE SARDINE); NAMI-NO-HANA (FLOWER OF THE WAVE.)

Atherinidæ ? Genus ? Species ISHIKAWA, Prel. Cat., 1897, p. 33, Boshu, Hashigo, Nos. 568, 569.

Head $5\frac{2}{3}$ in body without caudal fin; depth 5. Eye 3 in head; maxillary 3; pectoral $1\frac{1}{3}$; depth of head 1. Anal I, 23; dorsal IV—I, 16. Scales about 59; vertebrae $18+25=43$.

Body strongly compressed and deepest at pectorals. Dorsal profile obtusely rounded at snout, thence rather slightly and evenly rounded to second dorsal and becoming straight at the long caudal peduncle. Ventral profile with a sharp regular curve from tip of lower jaw to ventrals, thence almost straight to caudal. Body as viewed from before

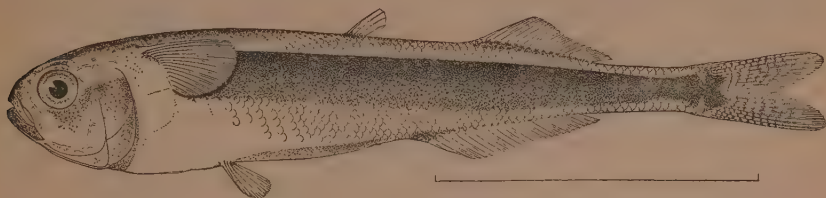


FIG. 4.—ISO FLOS-MARIS.

over twice as deep as wide; the back rounded; the greatest width in the upper third or fourth; thence tapering wedgelike to the sharp breast. The anterior part of sides of body and head flat below the temporal region.

Mouth small and very oblique; its angle about 45 degrees. The maxillary scarcely reaches to the vertical from the anterior rim of the orbit while the angle of the lower jaw reaches very slightly past. Mandible triangular in shape, three-fourths as wide as long. When the mouth is closed the mandible closes tightly within the maxillaries and upper jaw leaving the latter slightly projecting.

Teeth very small on jaws, vomer, and palatines, those on the jaws in a very narrow band. Snout a little shorter than the diameter of eye. Interorbital space a little wider than eye.

Gillrakers slender, about two-thirds the diameter of the eye in length; their number about $4+13$. The first and second gill arches entirely free from each other as usual, but the second and third, and the third and fourth are separated only by a short slit which is not longer than eye at about the angle; the fourth gill with only a tiny slit behind it.

Head entirely scaleless. Scales with entire smooth edges; those on anterior part of body variable; on some specimens the side is naked

anterior to a little behind the pectoral fin while the back and belly are naked anterior to the spinous dorsal and the vent; on others a few scales extend to a little in front of the ventrals, and nearly to the base of pectoral, while on the back they are present a short distance in front of the spinous dorsal. Between these two extremes are all gradations.

Pectoral broad and short, with a bluntly curved posterior outline; its tip in some specimens reaches slightly more than halfway between its upper base and spinous dorsal; in others scarcely halfway. Origin of ventrals about under the last fifth of pectoral fin; their length equal to snout and half eye. Front of spinous dorsal a little nearer snout than base of caudal fin (by from diameter of pupil to diameter of eye), and much nearer anterior end of anal base than base of ventrals. Base of second dorsal shorter than that of anal by a distance equal to a little more than diameter of eye; it ends a little posterior to anal. Second dorsal rays anteriorly a little higher than those of anal, which are higher than dorsal spines. Distance between front of first dorsal and front of second dorsal a little greater than the base of the latter, which in turn equals the length of caudal peduncle. Upper lobe of caudal equals the head's length. Belly with a thick sharp fleshy fold of skin. In two females with eggs this flap is absent.

Color.—Body probably translucent in life, colorless in spirits, with a broad lateral blackish and silvery band running from base of pectoral to base of caudal; its width near pectoral about equal to length of ventrals, growing somewhat broader posteriorly and reaching its greatest width behind its middle, thence growing narrow on caudal peduncle and broadening at base of rays, where a V-shaped area constricts it above and below, thence continuing on base of caudal rays as a double spot. The band black, with more or less silver diffused over it, except at its upper edge. Lower jaw dusky; top of head and snout with black markings. A double row of dots from first dorsal to occiput, with sometimes other scattering dots. Behind first dorsal is a broken band of dots, parting to run each side of second dorsal and continuing on caudal peduncle as a double row of dots or a diffused band. At shoulder is a dusky spot which is sometimes replaced by scattered dots. Opercles and cheeks more or less dusky. A dark spot at anterior anal base. Caudal finely marked with transverse zigzag dark bands.

This pretty little fish is common in the surf breaking into tide pools about Sagami and Izu, where numerous specimens were taken, the largest about $2\frac{1}{2}$ inches in length. Our specimens are from Enoshima, Misaki, Hada, Yogashima, and Hashigo, the last presented by Dr. Ishikawa. It is known to fishermen as Iso-iwashi or surf sardine, and as Namino-hana or flower of the waves.

The type, numbered 6527, in the Leland Stanford Junior University Museum catalogue.

(*Flos*, flower; *maris*, of the sea.)

THE CACOMITL CAT OF THE RIO GRANDE VALLEY.

By EDGAR A. MEARNs, M. D.,

Major and Surgeon, United States Army.

Professor Baird, on page 88 of his Mammals of North America, published in July, 1857, characterized the Cacomitl Cat under the name *Felis yaguarundi*, Desm., but in the synonymy of the species placed "*Felis cacomitl*, Berl. MSS.," and said: "A skull (No. 1426) of this species, in the collection of Dr. Berlandier, collected at Matamoras, with a full description of the animal by him, establishes a more northern range for this species than has hitherto been accorded. In its southern range it reaches as far as Paraguay. A full description of the skin and skull of this species will be found in the zoological report of the United States and Mexican Boundary Survey," where (p. 12) Baird quotes Berlandier's manuscript description. The name *Felis cacomitli*, as spelled by Berlandier, will date from the special report upon the Mammals of the Mexican Boundary, published in 1859, it being a *nomen nudum* as printed by Baird in 1857. The animal in question proves to be distinct from *Felis yaguarundi*,¹ and is described below:

FELIS CACOMITLI Berlandier.

CACOMITL CAT.

1857. *Felis cacomitl* BAIRD, Mammals of North America, p. 88, synonymy (*nomen nudum*).
1859. *Felis cacomitli* BERLANDIER, in Baird, Report United States and Mexican Boundary Survey, II, Mammals, p. 12 (original description).
1883. *Felis calomitti* ELLIOT, Monograph of the Felidæ, p. 97, synonymy.

Characters.—Proportions as in other members of the *Felis yaguarundi* group. Larger than Azara's "yagüarundi" (= *Felis yaguarundi*

¹ I have used the spelling of Azara, being uncertain as to the original reference. Trouessart's first reference is to Fischer's Zoognosia, but the name is not used in that work. Fitzinger's first binomial reference is "*Felis yagouarondi*. Geoffr. Catal. du Mus." [1803].

of authors); color lighter and grayer. Skull strongly constricted postorbitally, flattened superiorly. Mammæ; 3 pairs.

Color in summer (based on specimen No. $\frac{3435}{441}$, U.S.N.M., Biological Survey collection; adult female, taken at Brownsville, Texas, June 14, 1892).—Seen at a distance, the animal appears of a nearly uniform smoke-gray color, without strong contrasts. On close inspection the under surfaces of body and tail are seen to be considerably paler than the upper, and certain light and dark areas are apparent. Upper-parts, including upper side of tail and outer surface of limbs, uniform pepper-and-salt gray; underfur and concealed bases of the coarse overhair whitish gray; overhair 10 to 20 mm. in length, pointed with black and ringed with white, buff, and black. Under-parts paler, many of the hairs, especially of axillæ and hollows of thighs, being tipped with whitish. Under surfaces of fore and hind feet strongly tinged with bistre. Under side of tail whitish smoke-gray, the overhairs narrowly ringed with black. Head with areas of light buffy gray bordering the blackish eyering, on chin and throat, and within and behind ear; a short, narrow line of blackish midway between eyes, and another between ears, and faintly brownish black edges to the ears; muzzle tinged with wood brown. Whiskers mostly white, shading apically to hair brown; stiff hairs above orbits, 10 to 15 mm. in length and uniform hair brown. Claws light horn color.

Color in winter (based on specimen No. $\frac{328}{447}$, U.S.N.M., Biological Survey collection; adult female, taken at Brownsville, Cameron County, Texas, February 23, 1892).—Darker, pelage longer, with a greater amount of black in vertebral area than laterally; under side of feet bistre, upper side more mixed with brownish black; otherwise similar to the summer pelage above described.

Skull and teeth.—Skull compressed in front of orbits and flattened above; braincase narrow and strongly constricted postorbitally; nasal processes of frontals ending well in front of the plane of malar bone; nasal bones elongated laterally and strongly depressed; zygomata relatively broad posteriorly; audital bullæ large and high, antero-laterally compressed; posterior narial fossa wide. The canines, upper carnassials, and middle superior premolars are about the size of the same teeth in specimen No. 10018, U.S.N.M., assumed to represent the *Felis yaguarundi tolteca* of Thomas; but the upper lateral incisor, first premolar, and true molar are larger teeth. A supernumerary first upper premolar is present, on the right side only, in female No. 35953, U.S.N.M., from Texas (see measurements).

Remarks.—Mr. Oldfield Thomas¹ separates a subspecies *tolteca* from the true *Felis yaguarundi* of Paraguay. I have identified with

¹ Annals and Magazine of Natural History, 7th ser., I, p. 41, January, 1898.

Thomas's *Felis yaguarondi tolteca*, the type of which came from Tete-males, State of Sinaloa, Mexico, specimen No. 10018, U.S.N.M., from Tehuantepec, Mexico. Although the skull of this specimen is longer by 11 mm. than the type, it agrees with it so closely in proportions that it must be regarded as probably conspecific. Besides the difference in the size of the upper true molar and first premolar, which are much smaller, the skull is higher and more convex, zygomata more massive, and audital bullæ lower and more inflated anteriorly than in *Felis cacomitli*. The skull is also remarkable for the great postorbital breadth of the braincase and for the brevity of the nasal processes of the frontal bones, which end on a line vertically over the anterior extremities of the jugals. *Felis cacomitli* requires no color comparison with *Felis yaguarondi tolteca*. Mr. Thomas regarded the latter as probably the same as Baird's "*Felis cacomitli*, Berl. MSS.," in the synonymy of *F. yaguarundi*, but did not consider the name tenable.

External measurements.—Average of two adult females (described above): Length, 1060 mm.; tail vertebræ, 480; length of hind foot, 140; height of ear above crown, 40.

Cranial measurements.—I have used the same cranial measurements as Thomas, for convenience of comparison with *Felis yaguarondi tolteca*, those of his type following in parenthesis those of specimen No. 35645, U.S.N.M., an adult male of *Felis cacomitli* from Texas: Basilar length of Hensel, 95 (82); zygomatic breadth, 70 (64); least interorbital breadth, 20 (18); intertemporal breadth, 30 (33.5); breadth of braincase above auditory meatus, 46 (43); palate, length from henselion to posterior edge, excluding median notch, 40.7 (36); breadth between outer corners of carnassials, 39 (38.7); breadth of posterior narial fossa, 13.3 (14); front of canine to back of carnassial, 31 (28.7); length of upper carnassial, 13 (11.3); length of lower carnassial, 9 (9).

Average and extremes of four adult females from Texas and Matamoros, Mexico: Basilar length of Hensel, 87.4 (85.5–89); zygomatic breadth, 64.5 (64–66); least interorbital breadth, 18 (17–19); intertemporal breadth, 29.5 (28.5–30); breadth of braincase above auditory meatus, 44 (43–45); palate, length from henselion to posterior edge, excluding median notch, 36.4 (36–37); breadth between outer corners of carnassials, 38 (37–38.5); breadth of posterior narial fossa, 12.9 (12.7–13); front of canine to back of carnassial, 29.5 (28.5–30); length of upper carnassial, 12.5 (12.3–12.8); length of lower carnassial, 8.9 (8.8–9).

Detailed cranial measurements of *Felis yaguarondi tolteca* and *F. cacomilli*.

Name.	<i>Felis yaguarondi tolteca</i> Thomas.		<i>Felis cacomilli</i> Berlandier.				
Sex, number, and locality.	Male, type of <i>Felis yaguarondi tolteca</i> (from Thomas).	Male (?) No. 10018, Tehuantepec, Mexico.	Male, No. 35645, Brownsville, Texas.	Female, No. 35953, Brownsville, Texas.	Female, No. 46441, Brownsville, Texas.	Female, No. 46441, Brownsville, Texas.	Female, type of <i>Felis cacomilli</i> , Matamoros, Mexico, No. 1426.
Basilar length of Hensel	82	93	95	88	89	87	85.5
Zygomatic breadth	64	70	70	64	66	64	64
Least interorbital breadth	18	22	20	18	19	17	18
Intertemporal breadth	33.5	35	30	29.5	30	28.5	30
Breadth of braincase above auditory meatus	43	47	46	45	44	43	44
Palate, length from henselion to posterior edge, excluding median notch	36	38	40.7	36.7	37	36	36
Breadth between outer corners of carnassials	38.7	40.3	39	38	38.5	37.5	37
Breadth of posterior narial fossa	14	14.3	13.3	13	12.7	13	13
Front of canine to back of carnassial	28.7	30	31	28.5	29.5	30	30
Length of upper carnassial	11.3	12.3	13	12.5	12.8	12.5	12.3
Length of lower carnassial	9	9	9	8.8	9	9	8.9

A NEW SPECIES OF BULLFROG FROM FLORIDA AND THE GULF COAST.

By LEONHARD STEJNEGER,

Curator, Division of Reptiles and Batrachians.

A few years ago Mr. Robert Ridgway, returning from a collecting trip in southern Florida, assured me that the bullfrog there had such a peculiar voice that he could scarcely believe it to be the same species as the one found elsewhere in the United States. Moreover, it was so excessively shy and wary that he had failed to secure any specimens. Requests were sent to various correspondents to catch and forward specimens, but they were equally unsuccessful.

During the summer of 1900 Mr. Gerrit S. Miller, jr., obtained a series of live bullfrogs from New Hampshire and another from Bay St. Louis, Mississippi, all of which he kindly donated to the Museum. It was at once apparent that there was a great difference between the two lots, the northern ones being much greener and lighter, the southern specimens being brown and dark, with very little green. The large series of alcoholic bullfrogs in the collection of the U. S. National Museum failed to throw any light upon this question. The difference of the proportions of the toes was also noted, but as specimens from New Orleans did not correspond in this respect the importance of that character was not realized at the time, and the question of the specific or subspecific distinction of the Bay St. Louis specimens was left in abeyance pending the accumulation of additional material.

This additional material was obtained recently when Dr. E. A. Mearns, U. S. A., sent a lot of bullfrogs from Kissimmee, Florida, with the statement that their voice was entirely different from that of the northern bullfrogs, resembling the grunt of a herd of pigs. He also reported that they were very difficult to catch.

Here was clearly the Florida bullfrog mentioned by Mr. Ridgway, and a direct comparison with the Bay St. Louis specimens proved the identity of the Florida and Mississippi form. The whole series of the museum was then carefully reviewed, with the result of finding two additional specimens of the new species from Pensacola.

RANA GRYLIO, new species.

Diagnosis.—Similar to *Rana catesbeiana*, but with the fourth toe much shorter in proportion, the third toe, measured from the inner metatarsal tubercle, being more than three and one-half times the difference between the third and fourth toes.

Type.—Cat. No. 27443, U.S.N.M.; Bay St. Louis, Mississippi.

Habitat.—Florida and Gulf coast west to Mississippi.

Remarks.—The most obvious difference between this species and the ordinary bullfrog (*Rana catesbeiana*) is the great length of the toes, except the fourth, the latter consequently projecting much less beyond the others than in *R. catesbeiana*, in which the third toe, measured from the inner metatarsal tubercle, is considerably less than three and one-half times the difference between it and the fourth toe. In fact, this difference is seldom more than one-fourth in the new species and seldom less than one-third in *R. catesbeiana*.

In order to ascertain exactly the proportions of the first four toes in both species large series of both species were measured, viz: 12 of *R. grylio* and 50 of *R. catesbeiana*, the measurements, as well as their equivalents expressed in percentages of the fourth toe, being given at the end of this article. In order to get as stable a starting point as possible for these measurements the anterior edge of the inner metatarsal tubercle was chosen and the length of the toe in this case consequently means the distance from this point to the tip of the toe in question.

The proportions obtained in this way may be expressed as follows:

	<i>Rana grylio</i> .	<i>Rana catesbeiana</i> .
	Per cent of fourth toe.	Per cent of fourth toe.
Third toe.....	80 to 84	70 to 76
Second toe.....	55 61	47 51
First toe.....	34 39	27 33

There is consequently no overlapping or intergrading. The fourth toe has the same relative length in both species, but in the new one the other toes have become considerably lengthened, thus giving a much larger surface of web than in the ordinary bullfrog.

From the above it will be seen that a specimen of *Rana grylio*, in which the distance from the tip of the fourth toe to the anterior edge of the inner metatarsal tubercle measures 50 mm., should normally have—

The first toe, similarly measured, 18.5 mm. (varying between 17 mm. and 19.5 mm.).

The second toe, similarly measured, 29 mm. (varying between 27.5 mm. and 30.5 mm.).

The third toe, similarly measured, 41 mm. (varying between 40 mm. and 42 mm.).

Conversely, a *Rana catesbeiana* of exactly the same size (fourth toe 50 mm.), should normally have—

The first toe, similarly measured, 15 mm. (varying between 13.5 mm. and 16.5 mm.).

The second toe, similarly measured, 24.5 mm. (varying between 23.5 mm. and 25.5 mm.).

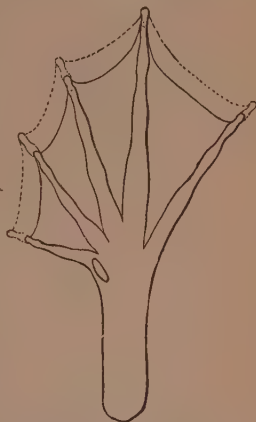
The third toe, similarly measured, 36.5 mm. (varying between 35 mm. and 38 mm.).

These average proportions are shown diagrammatically in the accompanying figure, in which the dotted outline represents an average *R. grylio* and the solid lines an average *Rana catesbeiana*.

These differences in the relative length of the toes, being capable of the most concise definition, have been utilized primarily for the characterization of the new species, but there are numerous other features which prove it to be very distinct from *R. catesbeiana*. Thus for instance, the snout is much shorter and less high, so that the nostrils appear to be nearer the tip of the mouth; the head is also narrower behind; the vomerine teeth are very close together, with hardly any space between the two patches; the tongue is much broader and thinner, with remarkably long and thin "horns," which are very far apart; the color is apparently much darker brown, though there may be *R. catesbeiana* nearly as dark. Add to this the difference in voice and we have clearly one of the most distinct species of frog in the United States.

The general habitus of *R. grylio* is that of *R. catesbeiana*, including the large tympanum and the absence of a dorso-lateral glandular fold. It is also a large frog, though whether it reaches the extreme size of *R. catesbeiana* may be doubted.

The range of the new species is as yet known but fragmentarily, as we have specimens only from southern Florida, Pensacola, Florida, and Bay St. Louis, Mississippi. The habitat of *R. grylio* is thus partly occupied by *R. catesbeiana*, which certainly occurs in northern Florida and on the Gulf coast reaches New Orleans. The overlapping of the two forms affords additional evidence of their specific distinctness, if such were needed. It may be mentioned in this connection that the most southern specimens of *R. catesbeiana* do not show the slightest tendency of a variation toward *R. grylio*, as is clearly proven by the measurements in the appended tables.



DIAGRAMMATIC OUTLINES OF HIND FEET OF *R. catesbeiana* AND *R. grylio*, THE FORMER IN SOLID LINES AND THE LATTER DOTTED.

Measurements of *Rana grylio*.

U.S.N.M. No.	Locality.	Distance of tip of toes from inner metatarsal tubercle.								Difference between third and fourth toes in mill- imeters.
		In millimeters.				In percentages of fourth toe.				
		First toe.	Second toe.	Third toe.	Fourth toe.	First toe.	Second toe.	Third toe.	Fourth toe.	
27443	Bay St. Louis, Mississippi.....	21	33	46.5	57.5	36	57	80	100	11
27444	do.....	16	23.5	34	42.5	38	55	80	100	8.5
27445	do.....	19	30	42.5	53	36	56	80	100	10.5
27446	do.....	17	29	42	50	34	58	84	100	8
27447	do.....	18	28.5	40.5	49	37	58	83	100	8.5
3688 (a)	Pensacola, Florida.....	19	30.5	40	50	38	61	80	100	10
3688 (b)	do.....	17	27	37.5	46	37	58	81	100	8.5
29007	Kissimmee, Florida.....	17	26.5	38	45	38	59	81	100	7
29008	do.....	20.5	32	45	55.5	37	58	81	100	10.5
29009	do.....	9	14.5	20.5	25.5	35	57	80	100	5
29010	do.....	20	32	43.5	53.5	37	59	81	100	10
29011	do.....	12	19	-----	31	39	61	-----	100	-----
Average of 12 specimens.....		-----	-----	-----	-----	37	58	81.3	100	-----

Measurements of *Rana catesbeiana*.

U.S.N.M. No.	Locality.	Distance of tip of toes from inner metatarsal tubercle.								Difference between third and fourth toes in millimeters.
		In millimeters.				In percentages of fourth toe.				
		First toe.	Second toe.	Third toe.	Fourth toe.	First toe.	Second toe.	Third toe.	Fourth toe.	
9475	St. Johns River, Florida.....	15	26	39	53.5	28	49	73	100	14.5
3539	Prairie Mor Rouge, Louisiana.....	22.5	34.5	52.5	71	31	48	73	100	18.5
9469	New Orleans, Louisiana.....	21.5	35	52.5	70	30	50	74	100	17.5
13201	do.....	5	9	13	18	28	50	72	100	5
3687	Mobile, Alabama.....	21.5	34.5	52	72	30	48	72	100	20
9389	Liberty County, Georgia.....	9	15	22.5	30.5	29	49	73	100	8
3512	Riceboro, Georgia.....	10.5	18	26.5	36.5	29	49	72	100	10
3508	Charleston, South Carolina.....	15.5	24.5	37.5	50.5	31	49	74	100	13
10878	Oakley, South Carolina.....	23.5	38	57.5	78.5	30	48	70	100	21
10879	do.....	19.5	32.5	49	66.5	29	49	73	100	17.5
15984	Goldsboro, North Carolina.....	11.5	19	29	39.5	30	49	75	100	10.5
15986	Raleigh, North Carolina.....	13	22	33	46	28	48	72	100	13
3691	Tarboro, North Carolina.....	16.5	28.5	42	57	29	50	73	100	15
14441 (a)	Wytheville, Virginia.....	19.5	31	45	61.5	31	50	72	100	16.5
14441 (b)	do.....	20	31.5	46	63	32	50	73	100	17
10340	Arlington, Virginia.....	20	32	48	64.5	31	50	74	100	16.5
10099	Southampton County, Virginia.....	20	33.5	49.5	67	30	50	74	100	17.5
15277	District of Columbia.....	11.5	19.5	29	41	28	47	70	100	12
14544	do.....	5	8.5	12	17	29	50	70	100	5
17365	do.....	14.5	25	37	50.5	29	49	73	100	13.5
26321	Laurel, Maryland.....	13.5	22.5	33.5	46	29	49	73	100	12.5
26320	do.....	16.5	28.5	42	58	28	49	72	100	16
3532	Carlisle, Pennsylvania.....	19.5	32	46	65	30	49	70	100	19
3531 (a)	Foxburg, Pennsylvania.....	13	22	32	44	29	50	73	100	12
3531 (b)	do.....	17.5	28	40.5	56	31	50	72	100	15.5
3513	Lancaster County, Pennsylvania.....	18	28.5	43.5	58.5	31	48	74	100	15
4835	Brookville, Pennsylvania.....	15.5	24	36	48.5	32	49	74	100	12.5
3534 (a)	Saranac Lake, New York.....	10	17.5	26	36.5	27	48	71	100	10.5
3534 (b)	do.....	13.5	23	34	46	29	50	74	100	12
3534 (c)	do.....	17	25.5	39	51	33	50	76	100	12
3533 (a)	Westport, New York.....	14.5	24	35	48	30	50	73	100	13
3533 (b)	do.....	18	29.5	44.5	59.5	30	49	75	100	15
3507 (a)	Elizabethtown, New York.....	10.5	18	26.5	36.5	29	49	72	100	10
3507 (b)	do.....	13	21	32	42.5	30	49	75	100	10.5
3507 (c)	do.....	13.5	21	32	43.5	31	48	73	100	11.5

Measurements of *Rana catesbeiana*—Continued.

U.S.N.M. No.	Locality.	Distance of tip of toes from inner metatarsal tubercle.								Difference between third and fourth toes in milli- meters.
		In millimeters.				In percentages of fourth toe.				
		First toe.	Second toe.	Third toe.	Fourth toe.	First toe.	Second toe.	Third toe.	Fourth toe.	
3507 (d)	Elizabethtown, New York.....	11.5	19	28.5	38.5	30	49	74	100	10
3507 (e)	do.....	13	20.5	30.5	41	31	50	74	100	10.5
3507 (f)	do.....	11	18	27	36.5	30	49	74	100	9.5
27435	Intervale, New Hampshire.....	19	29	44	59.5	32	49	74	100	15.5
27437	do.....	18.5	30	43.5	60	31	50	72	100	16.5
27438	do.....	17.5	29.5	43.5	59	29	50	73	100	15.5
27439	do.....	18	28	43.5	57	31	49	76	100	13.5
27440	do.....	16.5	28.5	41.5	57	29	50	73	100	16.5
27441	do.....	19	30	45	60	31	50	75	100	15
27442	do.....	11.5	18.5	27.5	37	31	50	74	100	9.5
3339	Rock Mary.....	13	21	32.5	42.5	30	49	76	100	10
3337	Red Rock, Arkansas.....	24	38.5	58	77	31	50	75	100	19
3321 (a)	Fort Smith, Arkansas.....	7.5	11.5	17.5	23	32	50	76	100	5.5
3321 (b)	do.....	7	11	16.5	22.5	31	49	73	100	6
3520	St. Louis, Missouri.....	12.5	20	30	40	31	50	75	100	10
Average of 50 specimens.....		.....	.....	.....	.....	30	49.2	73.2	100	.....

SOME SPIDERS AND OTHER ARACHNIDA FROM PORTO RICO.

By NATHAN BANKS,
Custodian of Arachnida.

This paper is based principally on material collected in Porto Rico by Mr. August Busck, who visited that island in the early part of 1899. Since then some specimens have been received from several collectors whose names will be found in connection with the species they collected. All uncredited records are those of Mr. Busck.

This list shows a total of forty-nine spiders and five other arachnids. Although there are less than fifty spiders they are disposed in fifteen families. The Epeiridæ stands first with sixteen species; no other family having more than four species, and four families are represented by but one species each. There are but few small forms in the collection, although these are doubtless fairly common on the island. Two spiders and the phalangids are described as new, a few other species are probably new, but more material is necessary for determination.

Most of the species are quite widely distributed in the West Indies and the northern border of South America. A few species are known only from Porto Rico, but with larger collections from the other islands these forms will be found to occur elsewhere. Twenty of the spiders are known to occur in the United States, mostly in the extreme southern portions. This collection would indicate that the Porto Rican fauna is more intimately related to that of northern South America than to the fauna of the United States.

The material forms part of the collection of Arachnida of the United States National Museum.

Order ARANEIDA.

Family THERAPHOSIDÆ.

AVICULARIA LÆTA Koch.

Mygale læta KOCH, Die Arach., IX, 1842, p. 66.

Two specimens; one from Culebra Island, February 11, the other from Utado, January 27. Koch's figure is not good, but the scopulas, when dry, are plainly greenish; venter is black. A true *Avicularia*. It was described by Koch from Porto Rico.

SCHIZOPELMA ERICHSONII Koch.

Mygale erichsonii KOCH, Die Arach., IX, 1842, p. 28.

Various specimens; Lares, January 25; Anasas, January 20; Culebra Island, February 8; San Juan, January 1-10; also Hacienda Esparranza, June 6, from E. A. Wagener, and Isolina, April. Koch's figure, as usual, is too highly colored, but the specimens agree well with his description; the legs are lineate as he figures them. The type was from Santo Domingo.

ISCHNOCOLUS Species.

One female and several young from El Yunque, 2,800 feet, February (Richmond). It has black mandibles; all scopulas are divided, the hind ones broadly; tibiae and metatarsi III and IV, with spines in rows beneath; sternum flat, nearly circular; anterior eye-row straight.

Family FILISTATIDÆ.

FILISTATA CAPITATA Hentz.

Filistata capitata HENTZ, Jour. Bost. Soc. Nat. Hist., IV, 1842, p. 228.

Teratodes depressus KOCH, Die Arach., IX, 1842, p. 103.

Filistata cubæcola LUCAS, Sagra's Hist. d. Cuba, Ar., 1853, p. 74.

One specimen from San Juan, January 1-10.

Family SCYTODIDÆ.

SCYTODES LONGIPES Lucas.

Scytodes longipes LUCAS, Ann. Soc. Ent. France, 1845, p. 71.

Scytodes marmorata TACZANOWSKI, Hor. Soc. Ent. Ross, 1873, p. 107.

Scytodes taczanowskii THORELL, Ragni. Mal., IV, 1890, p. 301.

Two specimens; one from Lares, January 25, the other from Luquillo, March 4 (Richmond).

SCYTODES FUSCA Walckenaer.

Scytodes fusca WALCKENAER, Aptères, I, 1837, p. 272.

Scytodes guyanensis TACZANOWSKI, Hor. Soc. Ent. Ross, 1873, p. 108.

Several specimens from a cave near Pueblo Viejo, February 17 (Stejneger and Richmond).

Family CLUBIONIDÆ.

AYSHA TENUIS Koch.

Anyphaena tenuis KOCH, Arach. Fam. Drass., 1867, p. 211.

Several specimens from Culebra Island, February, and San Juan, January 1-10. Described from Santo Domingo, but now known to occur on several of the West India islands.

CHIRACANTHIUM INCLUSUM Hentz.

Clubiona inclusa HENTZ, Journ. Bost. Soc. N. H., V, 1847, p. 451.

Chiracanthium viride EMERTON, Trans. Conn. Acad., VIII, 1890, p. 20.

One pair from Aguadilla, January. Widely distributed throughout temperate and subtropical America.

HYPSINOTUS HUMILIS Keyserling.

Hypsinotus humilis KEYSERLING, Verh. zool.-bot. Ges. Wien, 1884, p. 446.

One specimen from Luquillo, March 4 (Richmond). Another from Hacienda Esparanza, June 6 (Wagener). Described from St. Kitts.

Family **ULOBORIDÆ**.**ULOBORUS GENICULATUS** Olivier.

Araneus geniculatus OLIVIER, Encyl. Meth., II, 1789, p. 214.

Uloborus zosis WALCKENAER, Aptères, II, 1842, p. 231.

One specimen from Lares, January 25. A well-known cosmopolitan spider.

Family **PHOLCIDÆ**.**ARTEMA ATLANTA** Walckenaer.

Artema atlanta WALCKENAER, Aptères, I, 1837, p. 656.

Pholcus convexus BLACKWELL, Ann. Mag. Nat. Hist., (2), III, 1858, p. 332.

Two specimens from Utado, January. Distributed throughout the tropical regions of America.

Family **THERIDIIDÆ**.**LATHRODECTES MACTANS** Fabricius.

Aranea mactans FABRICIUS, Entom. Syst., II, 1775, p. 410.

Theridium formidabilis WALCKENAER, Aptères, I, 1837, p. 647.

Lathrodectus dotatus KOCH, Die Arach., VIII, 1841, p. 115.

Theridium verecundum HENTZ, Jour. Bost. Soc. N. H., VI, 1850, p. 280.

Several specimens from Mayaguez, January. Common in the tropical and subtropical parts of America.

THERIDIUM VOLATILE Keyserling. (?)

Theridium volatile KEYSERLING, Die Spinn. Amer., Therid., I, 1884, p. 60.

One immature specimen from Culebra Island, February, apparently belonging to this species. It was described from Venezuela, but also occurs in Florida.

Family TETRAGNATHIDÆ.

TETRAGNATHA LABORIOSA Hentz.

Tetragnatha laboriosa HENTZ, Jour. Bost. Soc. N. H., VI, 1850, p. 27.

One male from Utado, January, is rather smaller than usual, but does not appear to differ from Florida specimens.

TETRAGNATHA ANTILLIANA Simon.

Tetragnatha antilliana SIMON, Proc. Zool. Soc. London, 1897, p. 868.

One female from Lares, January 25. Readily known by the large tooth on apex of mandible below. It appears to be very close to *T. protensa* Keyserling, from Mauritius. It was described from St. Vincent.

TETRAGNATHA VICINA Simon.

Tetragnatha vicina SIMON, Proc. Zool. Soc. London, 1897, p. 869.

One pair from San Juan, January 1-10. The female is much like that of *T. antilliana*, but the lower apical tooth is much smaller. Described from St. Vincent.

EUGNATHA GRACILIS Cambridge.

Eugnatha gracilis CAMBRIDGE, Biol. Cent.-Amer., Arach.-Aran., I, 1889, p. 11.

One male and two young from Bayamon, January. The tibial joint of the male palpus is longer than in *E. pallida*.

Family EPEIRIDÆ.

ARGYROEPEIRA ARGYRA Walckenaer.

Tetragnatha argyra WALCKENAER, Aptères, II, 1842, p. 219.

Linyphia ornata TACZANOWSKI, Hor. Soc. Ent. Ross., 1873, p. 11.

Many specimens: Lares, January 25; Aguadilla, January; Vieques Island, February 11; Arroyo, February; and small specimens from El Yungue, March (Richmond). Common in tropical America.

ARGYROEPEIRA BIGIBBOSA Keyserling.

Meta bigibbosa KEYSERLING, Sitzungsber. d. Isis, Dresden, 1863, p. 144.

Several from Aguadilla, January, and El Yungue, March, 2,800 feet (Richmond). Known from northern South America.

ALCIMOSPHEENUS LICINUS Simon.

Alcimospheenus licinus SIMON, Hist. Nat. Ar., 2d ed., I, 1896, p. 931.

Two specimens from Adjuntas, April 13 (Richmond). It is strange that such a handsome species was not previously described. It occurs throughout the West Indian region. The markings vary in extent, and sometimes some are wanting.

ARGIOPE ARGENTATA Fabricius.

Aranea argentata FABRICIUS, Entom. Syst., II, 1775, p. 414.

Argiope fenestrinus KOCH, Die Arach., V, 1839, p. 155.

Several specimens: Culebra Island, February; Aguadilla, January; San Juan, January 1-10, and Utado, April 7 (Richmond). A large and well-known cosmotropical spider.

ARGIOPE FASTUOSA Olivier.

Araneus fastuosus OLIVIER, Encycl. Meth., II, 1789, p. 202.

Epeira fasciata HENTZ, Jour. Bost. Soc. N. H., V, 1847, p. 468.

Argiope transversa EMERTON, Trans. Conn. Acad., VI, 1884, p. 330.

Two females from San Juan, January 1-10. Common in the United States and Mexico.

NEPHILA WILDERI McCook.

Nephila wilderi MCCOOK, Amer. Spid., III, 1893, p. 251.

Nephila plumipes KOCH, Die Arach., VI, 1839, p. 138 (not of Latreille).

Two specimens from Aguadilla, January.

EPEIRA LABYRINTHEA Hentz.

Epeira labyrinthea HENTZ, Jour. Bost. Soc. N. H., V, 1847, p. 471.

Epeira rectangula NICOLET, Gay's Hist. d. Chile, Zool., III, 1849, p. 500.

Several specimens: Culebra Island, February; Aguadilla, January, and Vieques Island, March 27 (Richmond).

EPEIRA THEISII Walckenaer.

Epeira theisii WALCKENAER, Aptères, II, 1842, p. 53.

Epeira mangareva WALCKENAER, Aptères, IV, 1847, p. 469.

Many specimens: Culebra Island, January; Aguadilla, January; Bayamon, January; Mayaguez, January, and El Yungue, February 19. This is smaller and more slender than *E. oaxensis* Keyserling, and I think different, although small specimens of the latter look much like large specimens of the former. Widely distributed throughout the Tropics.

EPEIRA BALAUSTINA McCook.

Epeira balaustina MCCOOK, Proc. Acad. Nat. Sci. Phila., 1880, p. 198.

Epeira purpurascens CAMBRIDGE, Biol. Cent.-Amer., Arach.-Aran., I, 1889, p. 33.

One female from San Juan, January 1-10. Known from Florida and Mexico.

EPEIRA FUSCO-VITTATA Keyserling.

Epeira fusco-vittata KEYSERLING, Sitzungsber. d. Isis, Dresden, 1863, p. 129.

Cyclosa thorelli MCCOOK, Amer. Spid., III, 1893, p. 228.

A male from San Juan, January 1-10; a female from Utado, January. Distributed throughout the West Indian region.

EPEIRA GRANADENSIS Keyserling.

Epeira granadensis KEYSERLING, Sitzungsber. d. Isis, Dresden, 1863, p. 86.

Several specimens from Luquillo, March 4 (Richmond). This species is close to *E. trivittata*. Described from Colombia.

EUSTALA PROMPTA Hentz.

Epeira prompta HENTZ, Jour. Bost. Soc. N. H., V, 1847, p. 472.

Epeira parvula KEYSERLING, Sitzungsber. d. Isis, Dresden, 1863, p. 131.

One from El Yunque, 2,800 feet, February (Richmond). Distributed throughout the United States, Mexico, and West Indies.

EUSTALA CONCHLEA McCook.

Epeira conchlea MCCOOK, Proc. Acad. Nat. Sci., Phila., 1888, p. 199.

Epeira clavispina CAMBRIDGE, Biol. Cent.-Amer., Arach. Aran., I, 1889, p. 37.

One specimen from Utado, January. Probably only a variety of the preceding, and found in the southern United States and Mexico.

GASTERACANTHA HILARIS Thorell.

Gasteracantha hilaris THORELL, Öfvers. k. Vet-Akad. Förh., 1859, p. 302.

Gasteracantha canestrinii CAMBRIDGE, Proc. Zool. Soc. Lond., 1879, p. 282.

Several specimens from Aquadilla, January; and from Adjuntas, April (Richmond). Thorell's type came from the island of St. Bartholomew; Cambridge's was from Antigua. I also have it from Haiti.

GASTERACANTHA SEXSERRATA Walckenaer.

Plectana sexserrata WALCKENAER, Aptères, II, 1842,¹ p. 157.

Several specimens from Bayamon, January. Known from northern South America.

GASTERACANTHA TETRACANTHA Linnæus.

Aranea tetracantha LINNÆUS, Syst. Nat. II, 1740, p. 1037.

Plectana linnæi WALCKENAER, Aptères, II, 1842, p. 163.

Gasteracantha quadridens KOCH, Die Arach. XI, 1845, p. 59.

One specimen from Culebra Island, February. Known from the West Indian region.

Family **THOMISIDÆ**.**MISUMENA ASPERATUS** Hentz.

Thomisus asperatus HENTZ, Jour. Bost. Soc. N. H., V, 1847, p. 447.

Misumena rosea KEYSERLING, Die Spinn. Amer., Laterigr., 1880, p. 82.

Misumena foliata BANKS, Proc. Acad. Nat. Sci., Phila., 1892, p. 57.

Several specimens from El Yunque, and from Bayamon, January. Distributed throughout the United States, Mexico, and West Indies.

¹The oft-quoted date, "1837," for the second volume of this work is evidently wrong, as references in it to later dates are not uncommon, even 1841.

MISUMENA Species.

Two specimens, females, from San Juan, January, and Aguadilla, January. They are quite robust, pale, and with a white line through eye region.

Family SPARASSIDÆ.

SELENOPS INSULARIS Keyserling.

Selenops insularis KEYSERLING, Verh. zool.-bot. Ges., Wien, 1880, p. 311.

Three specimens from San Juan, January 1-10. Described from Porto Rico.

HETEROPODA VENATORIA Linnæus.

Aranea venatoria LINNÆUS, Syst. Nat., 10th ed., 1758, p. 1037.

Olios antillianus WALCKENAE, Aptères, I, 1837, p. 568.

Several specimens from San Juan, January 1-10. A wide-spread tropical species.

OLIOS ANTIGUENSIS Keyserling.

Sparassus antiguensis KEYSERLING, Die Spinn. Amer., Laterg., 1880, p. 264.

Several specimens from Utado, January, and from Culebra Island, February 9, the latter with egg sacs. Described from Antigua.

Family CTENIDÆ.

MICROCTENUS Species.

One female from a cave near Pueblo Viejo, February 17 (Richmond and Stejneger). It appears to be new; there is a broad, pale stripe on the cephalothorax, the abdomen dull gray, unmarked, mandibles black, the quadrangle of M. E. is as broad as high, narrow in front, A. M. E. small; second eye row nearly straight; legs rather long, IV longest, but patella plus tibia I is a trifle longer than patella plus tibia IV, the metatarsi and tarsi I being short; four pairs of spines under tibia I. The species of this genus and allied forms are very much mixed up.

Family LYCOSIDÆ.

LYCOSA AUSSERERI Keyserling.

Tarantula aussereri KEYSERLING, Verh. zool.-bot. Ges., Wien, 1876, p. 657.

Three examples: One Vieques Island, February; one Culebra Island, February 11, and one from Vieques Island, March 18 (Stejneger). Described from Santa Fé de Bogota. It is very close to our *L. erratica* Htz., but has a pale venter.

LYCOSA FUSCA Keyserling.

Tarentula fusca KEYSERLING, Verh. zool.-bot. Ges., Wein, 1876, p. 640.

Two specimens from San Juan, January 1-10, appear to belong to this species, which was described from Cuba. It is very close to, and perhaps identical with, *Lycosa atlantica* Marx, from the Bermudas.

PARDOSA PORTO-RICENSIS, new species.

Cephalothorax yellowish; eye region black, a broad, brown stripe each side reaching from side eyes to hind margin, the side margins narrowly black; mandibles yellowish, darker on the tips; sternum pale yellowish; legs pale, barred and ringed with brown; the marks on femora rarely show on the under side. Abdomen blackish above, with a broad, whitish median stripe reaching from base to tip, tapering somewhat from the basal third; venter pale yellowish. Cephalothorax not very long, quite broad, first eye row shorter than second, nearly straight, the eyes subequal; eyes of second row about one and one-half their diameter apart; mandibles long; legs quite long, three pairs of spines under tibia I, two pairs under metatarsi I. Length, 5 mm. One specimen from San Juan, January 1-10.

DOLOMEDES MARGINELLUS Koch.

Dolomedes marginellus KOCH, Die Arachn., XIV, 1848, p. 120.

One female from Vieques Island, March 25. Known from the coasts of tropical America.

Family **OXYOPIDÆ**.**OXYOPES SALTICUS** Hentz.

Oxyopes salticus HENTZ, Jour. Bost. Soc. N. H., V, 1845, p. 196.

Oxyopes gracilis KEYSERLING, Verh. zool.-bot. Ges. Wien., 1876, p. 698.

Several specimens from El Yunque and Culebra Island, February. Widely distributed throughout both North and South America.

OXYOPES Species.

A few specimens of uncertain position from Culebra Island, February.

Family **ATTIDÆ**.**PLEXIPPUS PAYKULLI** Audouin et Savigny.

Attus paykulli AUDOUIN et SAVIGNY, Descr. de l'Égypte, XXII, 1827, p. 172.

Attus ligo WALCKENAER, Aptères, I, 1837, p. 426.

Many specimens: Lares, January 25; Adjuntas, February 14 (Richmond); San Juan, March 31 (Richmond), and Arecibo, April 3 (Richmond). A well-known cosmotropical spider.

WALA VERNALIS Peckham.

Anoka vernalis PECKHAM, Proc. Zool. Soc. London, 1893, p. 701.

Several specimens from San Juan, January 1-10; Vieques Island, February, and Aguadilla, January. Described from Jamaica. The genus *Anoka* Peckham is synonymous with *Wala* Keyserling, since Keyserling's type appears to be our common *A. palmarum* Hentz.

PROSTHECLINA ILLUSTRIS Koch. (?)

Eris illustris KOCH, Die Arachn., XIII, 1846, p. 192.

One male from El Yunque, 2,800 feet, February 24 (Richmond), appears to be this species which Koch described from Porto Rico.

PROSTHECLINA SIGNATA, new species.

Male: Cephalothorax red-brown, eye region black, both with some iridescent scales, a row of green ones above the anterior eyes; mandibles dark brown; palpi light brown, the patella clothed above with shining snow-white hairs; legs yellowish brown, their anterior sides blackish, unbanded, tarsi nearly white; coxæ and sternum pale yellowish. Abdomen above dark brown; on each anterior side is an oblong patch of iridescent scales, and behind, on each posterior side, is a circle of iridescent scales, inclosing a jet-black spot; a black spot in front of the circle; venter black.

Female: Cephalothorax pale yellow-brown; eye region black, deeply emarginate behind, and there containing a large black spot which, tapering behind, is continued as a narrow median stripe to the posterior margin, the hairs each side of this are glistening white; from each dorsal eye there extends backward a broad dark-brown stripe; a point of white hair between the anterior eyes above; mandibles brown; palpi pale, annulate; legs pale, marked and annulate with black, not very plainly on the anterior pairs; sternum and coxæ pale yellowish. Abdomen brown, with a glistening white line around the base; from it, each side, is a submedian white line reaching toward the middle of dorsum; behind this on each side is a white circle inclosing a black patch; the circle is often extended backward to the spinnerets; in front of the circle is another black patch; venter pale, with a median brown stripe, and darker marks on the sides.

Length, male 3.0 mm., female 3.5 mm.

Several specimens from Utuado, January; Aguadilla, January; and Culebra Island, February.

Order SCORPIONIDA.

CENTRURUS INSULANUS Thorell.

Centrurus insulanus THORELL, Atti. Soc. Ital., XIX, 1877, p. 148.

Two specimens: Culebra Island, February 11, and Vieques Island, February. Known from several West Indian islands.

ISOMETRUS MACULATUS De Geer.

Scorpio maculatus DE GEER, Mém. Hist. Ins., VII, 1778, p. 346.

Scorpio americanus HERBST, Natursyst. ungefl. Ins. IV, 1800, p. 60.

Isometrus filum HEMPRICH and EHRENBURG, Sym. phys., Scorpi., 1828, p. 3.

Lychas paraensis KOCH, Die Arach., XII, 1845, p. 6.

One specimen from San Juan, February 13 (Stejneger). A common cosmotropical species.

Order PHRYNIDA.

PHRYNUS PALMATUS Herbst.

Phalangium palmatum HERBST, Natursyst. ungefl. Ins., I, 1800, p. 82.

Two specimens: Lares, January 25; Hacienda Esperanza, June 6 (Wagner). They will not agree with any of Pocock's numerous species based on forms of this variable Phrynid, and so might be classed as a new form.

Order PHALANGIDA.

CYNORTA OBSCURA, new species.

Dorsum brown, with yellowish marks; a spot at each posterior side of the cephalothorax usually connected by a curved transverse line; four transverse lines on the abdomen, the anterior two ending in a larger spot each side; some of these lines, usually the hind ones, are connected in the middle; legs and palpi pale, more or less netted with black; venter dark red-brown. Palpus of usual shape, legs not very long, with few granulations; hind coxæ with some short, but prominent blunt tubercles on outer side at base; eye tubercle very low. Abdomen with two submedian rows of four tubercles each; the basal four are very small and rounded, the next pair longer, prominent, and acute; the last pair somewhat smaller. In the male the legs are rather more granulate, the basal four tubercles are acute, and the mandibles are greatly enlarged above and gibbous, marked with netted and wavy dark lines.

Length, 5 mm.

Several specimens from Bayamon, January, and one from Ponce, April 16 (Richmond).

STYGNUS INSULANUS, new species.

Dark reddish brown, the hind margins of the median abdominal segments margined with pale; mandibles and palpi rather dirty yellowish; the tarsi pale, especially the hind pair. Eyes widely separated, between them a large spine that is bifid at tip; basal shield of abdomen smooth, with two submedian rows of four small tubercles each, each lateral margin with a row of rounded granules close by; behind the submedian tubercles are three median spines, the basal one smaller than the other two, which are nearly subequal; posterior segments with a few short spines. Mandibles large, second and third joints swollen above. Coxa of palpus with a spine beneath, femur with four spines below. patella unarmed, tibia swollen at tip and with two projections on inner margin. Legs short and slender, the fourth pair much the longest; femora II and III with a row of small spines

beneath; trochanter IV with one spine above, femur IV with a row of five large spines below and one at tip above; several near tip of the patella; a few small ones on tibia; tarsi of fore legs four-jointed, hind tarsi six-jointed, the basal joint longer than the others.

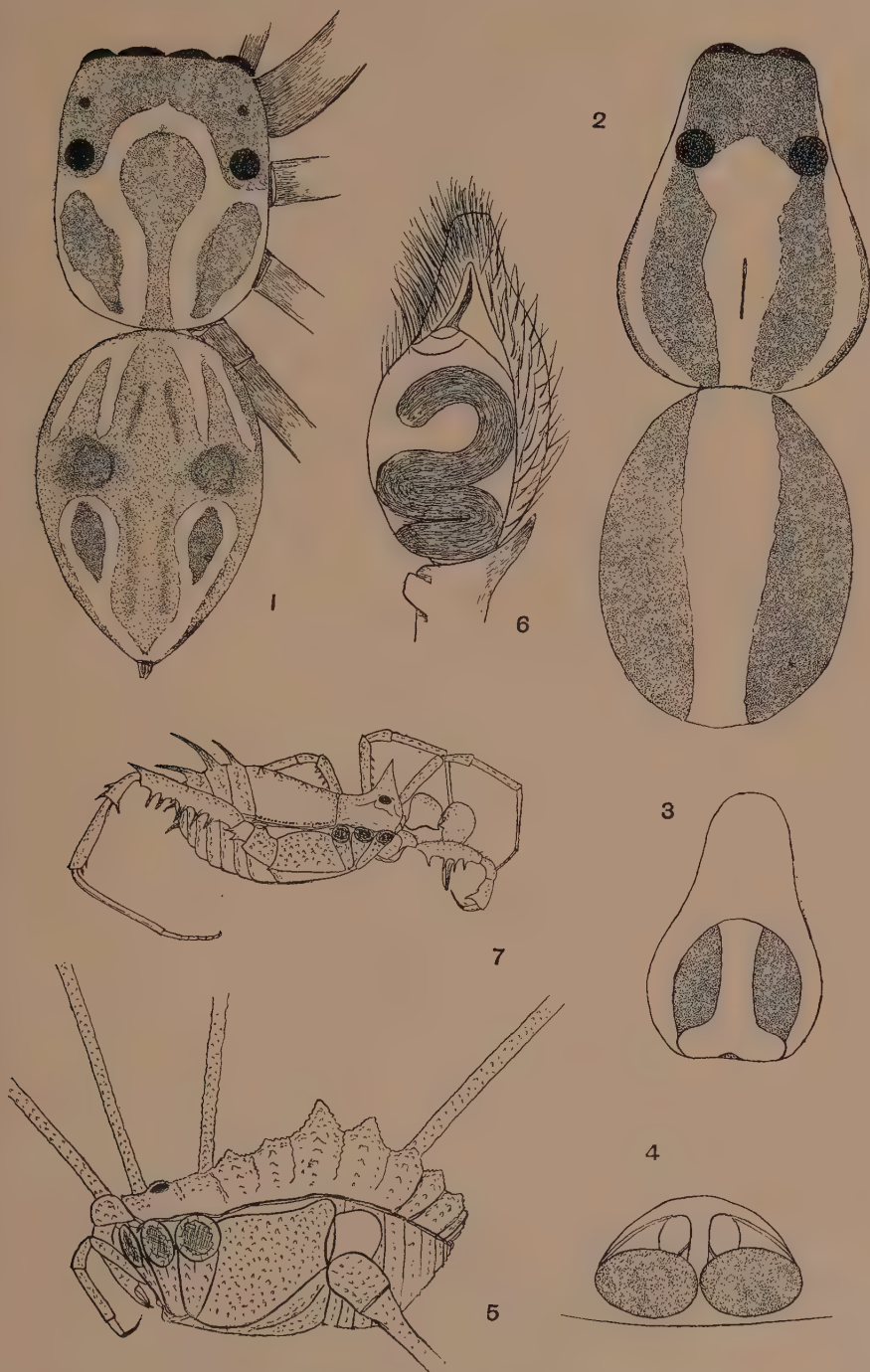
Length of body, 5.5 mm.

One specimen from El Yunque, 2,800 feet, February (Richmond).

This species is evidently related to *Styphelus flavitarsis* Simon, from Guadeloupe, but it has not the tarsal arrangement of that genus, so I retain it in the genus *Stygnus*. The tarsal characters, in my opinion, are scarcely of generic value. In Simon's species the ocular spine is not bifid at tip, and there are only two large median spines behind.

EXPLANATION OF PLATE XV.

- Fig. 1. *Prostheclina signata*, spider.
2. *Pardosa porto-ricensis*, spider.
3. *Pardosa porto-ricensis*, epigynum.
4. *Prostheclina signata*, epigynum.
5. *Cymorta obscura*, side view.
6. *Prostheclina signata*, palpus.
7. *Stygnus insularis*, side view.



SOME ARACHNIDA FROM PORTO RICO.

FOR EXPLANATION OF PLATE SEE PAGE 227.

A. REVIEW OF THE GYMNOTODONT FISHES OF JAPAN.

By DAVID STARR JORDAN and JOHN OTTERBEIN SNYDER,

Of the Leland Stanford Junior University.

In the present paper is given an account of the Gymnodont fishes (Tetraodontidæ, Tropodichthyidæ, Diodontidæ, Triodontidæ, and Molidæ) known from the waters of Japan. The paper is based on the collections made by the writers in Japan in 1900 under the auspices of the Hopkins Laboratory of Leland Stanford Junior University, and on the collections contained in the United States National Museum. A series of duplicates is in the United States National Museum. The accompanying drawings are the work of Miss Lydia M. Hart and Mr. A. H. Baldwin.

MEASUREMENTS.

The measurements given in this paper, except those quoted from other authors, were made as follows: Length of caudal peduncle, measured from end of base of anal to middle of base of caudal; length of head, from tip of snout to upper edge of gill opening; width of interorbital space, measured on the bony septum between the eyes; length of snout, from tip of snout to orbit; diameter of eye, longitudinal diameter of exposed iris; in numbering the dorsal and anal rays the short anterior rays are included.

Suborder GYMNOTONTES.

Plectognaths without a spinous dorsal, with the body short and with the belly inflatable; the scales typically spiniform, with root-like insertions, and with the jaws enveloped in an enamel-like covering, without distinct teeth. This group contains degraded Plectognaths, which have lost the scales, spinous dorsal, and distinct teeth. In the extreme forms the pelvis, ribs, and caudal vertebræ are also lost, the species depending on their dermal armature, leathery skin, or inflatable belly for protection from enemies, while little power of active movement remains. (*γυμνός*, naked; *ὀδούς*, tooth.)

- a. Pelvis very long, supporting the fan-shaped ventral area; upper jaw divided by a median suture; lower jaw undivided; skin covered with rough plates; nostrils as usual among fishes.....TRIODONTIDÆ I.
- aa. Pelvis and ribs obsolete.
- b. Caudal region normally developed, with a caudal peduncle.
- c. Upper and lower jaw each divided by a median suture; maxillaries and dentaries each curved outward behind the premaxillaries; ethmoid more or less projecting in front of frontals; postfrontals extending outward at least as far as frontals.
- d. Vertebræ comparatively few, 15 to 21 in number; dorsal and anal short, of 7 to 15 rays.
- e. Back broadly rounded; frontal bones articulated with the supraoccipital, postfrontals confined to the sides; ethmoid short, narrow, little prominent to view above; vertebræ few; head broad; nostrils various.
- TETRAODONTIDÆ II.
- ee. Back more or less sharply ridged; frontal bones separated from the supraoccipital by the postfrontals, which meet in the middle; ethmoid prominent above, enlarged and narrowed forward; snout pointed; dorsal and anal very short; nostrils obsolete or very small.
- TROPIDICHTHYIDÆ III.
- cc. Upper and lower jaw each undivided, the premaxillary and dentary bones coössified into sutureless arches; maxillaries extended laterally behind; body covered with stout, rooted spines.....DIDONTIDÆ IV.
- bb. Caudal region of body aborted, the body truncated behind the dorsal and anal; jaws each without median suture.....MOLIDÆ V.

Family I. TRIODONTIDÆ.

Body covered with small, bony, scale-like, partly imbricated laminae. Abdomen dilatable into a very large compressed pendant sac, kept expanded by a very long pelvic bone; lower part of sac merely a flap of skin, into which the air does not penetrate. Skeleton ossified, the ribs well developed. Dorsal and anal short. Tail long, ending in a many-rayed forked fin. Upper jaw divided by a median suture; lower entire. Nostrils normal, with two openings on each side.

A single known species, representing a transition from the ordinary fishes to the Gymnodont type.

1. TRIODON Reinwardt.

Triodon REINWARDT, Cuvier, Règne Anim., 3d ed., 1829, p. 588 (*bursarius*).

(Characters of the genus indicated above.)

(τρεις, three; ὀδόν, tooth.)

I. TRIODON BURSARIUS Reinwardt.

Triodon bursarius REINWARDT, Cuvier, Règne Animal, 2d ed., 1829, p. 588, Sumatra.—BLEEKER, Atlas Gymnodontes, 1867, p. 84, pl. x, fig. 1, Amboyna, Harouka, Banda.—GÜNTHER, Cat. Fish., VIII, 1870, p. 270, Mauritius, India.

Triodon macropterus LESSON, Voy. Coquille, 1830, p. 103, pl. iv, Mauritius.

Head, $3\frac{3}{4}$; depth, with sac, $3\frac{3}{4}$; depth, without sac, $3\frac{1}{2}$; dorsal rays 10; anal rays 9. Eye large, 4 in head; mouth rather large, its cleft as long as eye. Color brown, with a large irregular ocellated black spot

on side of body at base of ventral sac and between pectoral and anal. (Bleeker.)

East Indies, not common; rarely north to Japan; a specimen from Misaki in the Imperial University of Tokyo. Also recorded from Japan by Dr. S. Matsubara. (*Bursarius*, purse-like.)

Family II. TETRAODONTIDÆ.

PUFFERS.

Body oblong or elongate, usually little compressed, sometimes very broad; head and snout broad; belly capable of great inflation; skin scaleless, usually more or less prickly, the spines or prickles usually weak and movable, not rooted; rarely the skin is armed with bony scutes forming a sort of carapace; each jaw confluent, forming a sort of beak, which in each jaw is divided by a median suture; maxillaries curved outward behind the premaxillaries; lips full; nostrils various. Spinous dorsal and ventral fins wanting, the fins composed of soft rays only; dorsal fin posterior, opposite and similar to anal; caudal fin distinct; no ventral fins, the pelvic bone undeveloped; no ribs; pectoral fins short and broad, the upper rays longest; caudal fin and caudal vertebræ normally developed. Medifrontals articulated with the supraoccipital, the postfrontals confined to the sides, the ethmoid more or less projecting in front of frontals; postfrontals extending outward as far as frontals; proethmoid short and narrow, little prominent to view above; vertebræ few, 7 or 8 + 9 to 13. Gill openings small, placed close in front of pectorals; air bladder present. Fishes of sluggish movements, inhabiting warm seas, noted for their habit of filling the stomach with air. When disturbed they then float on the surface, belly upward. They are not much used as food, even in Japan, the flesh being ill-flavored and sometimes reputed poisonous.

- a. Frontal bones expanded sidewise and forming the lateral roofs of the orbits, the postfrontals limited to the posterior portions. Species chiefly marine.
- b. Nostril on each side with 2 distinct openings usually in a low tube or papilla; frontal region longer than broad.....*Spheroides*, 2.
- bb. Nostril on each side with a bifid tentacle without distinct opening; frontal region broader than long; fins rounded.....*Tetraodon*, 3.

2. SPHEROIDES Lacépède.

SWELL-FISHES.

Crayracion KLEIN, Missus 1742 (*spengleri*; nonbinomial).

Les sphéroides LACÉPÈDE, Hist. Nat. Poiss., II, 1798, p. 1 (French name only; *tuberculé*).

Spheroides DUMÉRIL, Zoologie Analytique, 1806, p. 342 (*tuberculatus*=*spengleri*, from a drawing showing a front view).

Orbidus RAFINESQUE, Analyse de la Nature, 1815, p. 90 (substitute for *Les sphéroides* Lacépède).

Sphæroides LACÉPÈDE, Pillot Edition, Hist. Nat. Poiss., VI, 1831, p. 279 (*tuberculatus*=*spengleri*).

- Lagocephalus* SWAINSON, Nat. Hist. Class. Fishes, II, 1839, pp. 194, 328 (*pennanti*=*lagocephalus*).
- Cirrhisomus* SWAINSON, Nat. Hist. Class. Fishes, II, 1839, pp. 194, 328 (*spengleri*).
- Cheilichthys* MÜLLER, Abhandl. Akad. Wiss. Berlin, 1839 (1841), p. 252 (*testudineus*).
- Physogaster* MÜLLER, Abhandl. Akad. Wiss. Berlin, 1839 (1841), p. 252 (*lunaris*) (name preoccupied).
- Gastrophysus* MÜLLER, Wiegmann's Archiv., IX, 1843, p. 330 (*lunaris*).
- Holacanthus* GRONOW, Syst. Nat., Ed. Gray, 1854, p. 23 (includes all *Tetraodontidæ* and *Diodontidæ*); name preoccupied.
- Anchisomus* KAUP MS., Richardson, Voyage Herald, 1854, pp. 156, 162 (*spengleri*, etc.).
- Les stenometopes* (*Stenometopus*) BIBRON, Revue de Zoologie, 1855, p. 279 (*testudineus*, etc.).
- Geneion* BIBRON, Revue de Zoologie, 1855, p. 279 (*maculatum*).
- Catophrynchus* BIBRON, Revue de Zoologie, 1855, p. 279 (*lampris*).
- Les promecocephales* (*Promecocephalus*) BIBRON, Revue de Zoologie, 1855, p. 279 (*argentatus*).
- Apsicephalus* HOLLARD, Études sur les Gymnodontes, 1867, p. 324 (*testudineus*, etc.).
- Liosaccus* GÜNTHER, Cat. Fish., VIII, 1870, p. 297 (*cutaneus*).

Body oblong or elongate; skin variously prickly or smooth, sometimes with cirri. A single, short, simple nasal tube on each side, with 2 rather large openings near its tip, the tube sometimes reduced to a mere rim. Dorsal and anal fins of 6 to 15 rays each; caudal truncate, rounded, or concave. Vertebrae 18 to 21. Frontal bones expanded sidewise and forming the lateral roof of the orbit, the postfrontals limited to the posterior portions. Species very numerous in warm seas. The group contains 2 or 3 strongly marked subgenera, which would be regarded as distinct genera if only extremes were considered. But the transition is very gradual from *Lagocephalus*, with elongate body, silvery skin, prominent lateral fold, long falcate dorsal and anal, with forked caudal, to typical *Spheroides*, with short fins and the form of *Tetrodon*. Most Japanese species belong to the subgenus *Lagocephalus*.

(σφαίρα, sphere; εἶδος, resemblance; the genus based on a front view, in which the fish was represented as spherical.)

- a. LAGOCEPHALUS. Dorsal and anal each with 12 to 14 rays, the fin usually acute at tip; nostril short, scarcely produced as a papilla.
- b. Caudal fin more or less distinctly lunate; dorsal and anal falcate; mucous tubes on head distinctly developed.
- c. Lateral fold on sides of body evident.
- d. Back and belly distinctly prickly, the prickles sometimes embedded in the skin.
 - e. Back with rather large scattered black spots; sides with a silvery band; gill opening black *sceleratus*, 2.
 - ee. Back nearly plain gray, without spots; sides silvery; gill opening pale.
 - spadiceus, 3.
 - eee. Back with close-set black dots, coarse or fine; sides not silvery; prickles very small, often entirely hidden *stictonotus*, 4.

- dd. Back and belly without prickles, or very nearly so; color plain brown above, without dark spots; sides silvery; lateral fold very distinct *inermis*, 5.
- cc. Lateral fold obsolete; color plain brown, a dark blotch behind pectoral; skin without prickles *porphyreus*, 6.
- bb. Caudal fin subtruncate or rounded; dorsal and anal less falcate; lateral fold usually obscure.
- f. Spots or stripes on body blackish, distinctly darker than the ground color, and well defined.
- g. Back and belly with strong prickles; region behind pectoral with a black blotch or black streaks; form robust; ground color brownish, the fins reddish.
- i. Side of tail without dark horizontal stripes; a large black ocellus behind pectoral, another at base of dorsal *rubripes*, 7.
- ii. Side of tail with two or three black horizontal stripes; back plain or with dark blotches *xanthopterus*, 8.
- gg. Back and belly without prickles; no distinct black blotch behind pectoral or at base of dorsal, the back and sides covered with round black spots; lateral fold evident.
- j. Caudal fin blackish, without bars or spots.
- k. Caudal fin rounded; spots on back sparse on a brownish ground color *pardalis*, 9.
- kk. Caudal fin truncate; spots on back close-set on a pale ground *abbotti*, 10.
- jj. Caudal fin barred, the bars formed of black spots on the rays; sides with a gray lateral band and large dark spots and vermiculations above it *exascurus*, 11.
- ff. Spots on body pale, light gray, or white (sometimes forming vermiculations about the darker ground color); a large blackish blotch behind pectoral and another below dorsal.
- l. Back and belly distinctly prickly.
- m. Black blotch behind pectoral connected by an ocellated black bar over the back with its fellow *ocellatus*, 12.
- mm. Black blotch behind pectoral not connected with its fellow; back with spots and streaks of gray. *alboplumbeus*, 13.
- ll. Back and belly without prickles or very nearly so; pectoral blotches not connected.
- n. Spots on back mostly broader than the interspaces, dull gray in color.
- o. Pale spots vermiculate, irregular in form; bony interorbital broad, $2\frac{1}{2}$ in head *vermicularis*, 14.
- oo. Pale spots rounded in the young, becoming with age pale areas which coalesce about round spots of the olivaceous ground color; bony interorbital narrow, $3\frac{1}{2}$ in head *borealis*, 15.
- nn. Spots on back pure white, sharply defined, mostly narrower than the interspaces *niphobles*, 16.
- aa. Dorsal and anal short, rounded in outline, each of 6 to 10 rays; nostrils in a prominent tube; caudal rounded; no lateral fold.
- p. SPHEROIDES. Body above and below closely prickly; back with irregular dark blotches. *richei*, 17.
- pp. LIOSACCUS. Body entirely smooth, back and sides chocolate brown, with irregular scattered black streaks and spots *chrysops*, 18.

2. SPHEROIDES SCELERATUS (Forster).

GINFUKU (SILVER PUFFER).

Tetraodon sceleratus (Forster) GMELIN, Syst. Nat., 1788, p. 1444 (Atlantic and Pacific oceans).—SCHNEIDER, Syst. Ichth., 1801, p. 506, fair description after Forster.—GÜNTHER, Cat. Fish., VIII, 1870, p. 276, Zanzibar, Ceylon, Madras, Amboyna, Philippines, Formosa, South Australia.—ISHIKAWA, Prel. Cat., 1697, p. 2, Kagoshima.

Tetrodon argenteus LACÉPÈDE, Ann. Mus. d'Hist. Nat., 1804, p. 211, pl. LVIII, fig. 2, New Holland.—SCHLEGEL, Fauna Japonica, Poiss., p. 275, pl. CXXI, fig. 2, Nagasaki.—BLEEKER, Atlas Gymnodontes, p. 64, pl. v, fig. 1, Java, Bali, Singapore, Bangka, Biliton, Borneo, Celebes, Amboyna.

Tetrodon argyroleura BENNETT, Proc. Comm. Zool., II, 1832, p. 184.

Tetrodon argentatus BLYTH, Prodr. Fauna, Zeyl., p. 49, Ceylon.

Tetrodon bicolor BREVOORT, Exped. Japan, 1856, p. 283, Shimoda.

Head $3\frac{3}{4}$; depth 4; dorsal rays 12; anal rays 12. Head and back covered with fine shagreen; abdomen with small, three-rooted spines; side naked. Body very slender, the tail depressed, the lateral fold distinct from the chin to the tail; dorsal and anal falcate; caudal lunate, with pointed angles; pectoral with its upper angle sharp. Greenish, with round scattered black spots above, not confluent and all smaller than pupil; sides with a distinct silvery band, below which is a brownish band which runs around the chin; a triangular silvery area before eye; gill opening jet black. Vertebrae $7 + 10 = 17$. Length $2\frac{1}{2}$ feet. (Günther.)

East Indies, north to Japan (Nagasaki, Kagoshima, Shimoda); rather scarce; not seen by us. (*Sceleratus*, rascally, the flesh being reputed poisonous.)

3. SPHEROIDES SPADICEUS (Richardson).

SABA-FUKU (MACKEREL PUFFER).

*Tetrodon lunaris*¹ SCHLEGEL, Fauna Japonica, 1847, p. 277, pl. CXXII, fig. 1, Nagasaki (probably not of Schneider, 1801).—NYSTROM, Handl. Svensk. Vet. Ak., 1887, p. 48, Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 1, Boshu, Tokyo.

Tetrodon spadiceus RICHARDSON, Voy. Sulphur, Ichth., 1844, p. 123, pl. LVIII, figs. 4, 5, Canton.—BLEEKER, Atlas Ichth. Gymnodontes, p. 64, pl. III, fig. 1, Java, Sumatra, Banka, Borneo, Celebes, Amboyna.

Tetrodon lunaris var. *spadiceus* GÜNTHER, Cat. Fish., VIII, 1870, p. 275, Vizagapatam, Malabar, Borneo, Philippines, China.

Head $3\frac{1}{2}$ in length; depth $3\frac{3}{4}$; depth of caudal peduncle 5 in head; eye $4\frac{1}{3}$; snout 2; interorbital space $2\frac{1}{2}$; dorsal rays 12; anal rays 12.

Body rather elongate, the caudal peduncle narrow, cylindrical; dorsal contour little elevated; head flat above, the interorbital space

¹According to Dr. Bleeker, *Spheroides spadiceus* is distinguished constantly from *S. lunaris* (Schneider) of the East Indies by the longer body, the relatively smaller head, the smaller eyes, the rounded and not angular form of the subocular part of lateral line, and by the smoothness of the region behind the tip of the pectoral. One of our specimens from Nagasaki has the subocular part of the lateral line evenly rounded, while the others have it quite angular.

slightly concave, the distance between eyes about equal to twice their diameter; snout rather long, about twice the diameter of eye. Nostrils separate, not tubular, in a shallow, oval depression, their distance anterior to eye about equal to half the space between eye and upper edge of gill opening. Teeth pointed in front, their cutting edges concave, the groove between upper teeth pronounced, bordered on each side by a ridge. Gill opening extending a little above base of pectoral, the inner or secondary flap completely hidden by the outer.

A line of mucous pores extending from the upper, anterior part of snout backward below eye, curving upward behind eye, passing in a broad curve above the pectoral, bending downward in the region of the dorsal, and running along middle of caudal peduncle to base of caudal fin; a transverse line extending across nape, connecting the lateral lines and forming the posterior boundary of a quadrangular space, the upper and anterior boundary lines of which unite to pass forward over the eye, then downward just posterior to the nostrils to join the lateral line; a branch line extending from snout, bending downward behind mouth to chin, then running backward along breast and disappearing on belly; each line composed of two rows of minute papillæ. A small but distinct ridge passing along lower side of head, below base of pectoral, curving upward over base of anal and extending along lower part of caudal peduncle to base of caudal fin. A dorsal patch of small prickles extending backward from nostrils, the posterior border acutely convex in shape, ending at a point above tips of pectorals; in one specimen a few prickles grow back almost to insertion of dorsal; throat, breast, and belly with a patch of prickles, larger and farther apart than those above, not extending to the vent.

Dorsal and anal somewhat falcate, the latter inserted on a vertical passing through a point a little anterior to the middle of the former; the dorsal slightly higher than the anal, $1\frac{1}{2}$ in head. Caudal lunate, the upper lobe slightly longer than lower. Edge of pectoral straight.

Color gray or faintly mottled above; silvery on lateral and ventral parts; fins pale; edges of dorsal and caudal darker.

Here described from Nagasaki specimens. An example from Tokyo has a brownish spot on upper part of base of pectoral.

East Indies, north to Japan; rather common. Our specimens from Tokyo (2) and from Nagasaki (3). (*Spadicæus*, nut-brown.)

4. SPHEROIDES STICTONOTUS (Schlegel).

Tetrodon stictonotus SCHLEGEL, Fauna Japonica, 1847, p. 280, pl. CXXVI, fig. 1, Nagasaki.—GÜNTHER, Cat. Fish., VIII, p. 281, Nagasaki.—NYSTROM, Hand. Svensk. Vet. Ak., 1887, p. 48, Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 2, Tokyo.

Gastrophysus stictonotus BLEEKER, Act. Soc. Indo-Nederl., Japan, IV, p. 30.

Head $3\frac{5}{8}$ in length; depth $4\frac{1}{2}$; depth of caudal peduncle $3\frac{3}{8}$ in head; eye $7\frac{1}{2}$; snout $2\frac{1}{2}$; interorbital space $2\frac{1}{5}$; dorsal rays 16; anal rays 14.

Body very long, the head much shorter than the distance between nape and insertion of dorsal; upper contour of head evenly rounded, the back not much elevated; caudal peduncle somewhat compressed, its depth $3\frac{2}{3}$ in head, its length about equal to that of head. Eye rather small, about $2\frac{3}{4}$ in snout. Interorbital space slightly convex, the distance between eyes $4\frac{1}{3}$ times their longitudinal diameter. Nostrils



FIG. 1.—*SPHEROIDES STICTONOTUS* (Nagasaki).

separate, located almost transversely on an oval elevation a little larger than pupil. Teeth bluntly pointed in front; the cutting edges concave, the groove between the teeth scarcely perceptible; ridges on either side of groove not prominent; upper and lower teeth of about the same width. Inner or secondary flap at gill-opening protruding.

Lines of mucous pores on body like those of *S. rubripes*. Lateral



FIG. 2.—*SPHEROIDES STICTONOTUS* (Hakodate).

fold evident, though not very prominent. Skin with small prickles, those on the upper anterior parts completely embedded; snout, sides of head, chin, upper and lower parts of caudal peduncle, and a narrow area along side of body naked.

Dorsal inserted a little in advance of anterior rays of anal; both fins falcate, of about equal height, $1\frac{2}{3}$ in head, the anterior rays shortened,

the fourth or fifth ray longest. Caudal truncate, the upper and lower rays slightly lengthened at tips. Posterior edge of pectoral straight or slightly convex; length 2 in head.

Color dark slaty gray above, belly white; sides of head closely sanded with black points; rest of body almost uniformly colored, without distinct points; dorsal and caudal black, the tip darkest.

Schlegel's description and figure of the species is founded on a stuffed skin, which accounts for the prominence of the prickles and the shortening of the space between the head and the insertion of the dorsal fin.

Coasts of Japan; here described from a fine specimen about 480 mm. long from Hakodate.

Two specimens, about 350 mm. long, from Misaki, agree with the above description except that they are very finely marbled above. Another of about the same length from Nagasaki is also finely marbled; in some places entirely black. (στικτός, spotted; νῶτος, back.

5. SPHEROIDES INERMIS (Schlegel).

KANABUKU (METAL PUFFER).

Tetrodon inermis SCHLEGEL, Fauna Japonica, 1847, p. 278, pl. CXXII, fig. 2, Shimabara.

Head $3\frac{1}{2}$; depth 3; dorsal rays 12; anal rays 12. Body rather elongate, the lateral fold distinct; back entirely smooth; belly with small spines; fins rather falcate; the caudal lunate, with pointed angles.

Color olive-green, unmarked; sides and below silvery. (Schlegel.)

Southern Japan, once taken at Shimabara in Kiusiu, not seen by us; evidently very close to the American species *S. lævigatus*. (*inermis*, unarmed.)

6. SPHEROIDES PORPHYREUS (Schlegel).

NAMERABUKU (SLEEK PUFFER).

Tetrodon porphyreus SCHLEGEL, Fauna Japonica, 1847, p. 282, pl. CXXI, fig. 1, Nagasaki.—GÜNTHER, Cat. Fish., VIII, 1870, p. 287 (after Schlegel).—NYSTROM, Handl. K. Svensk. Vet. Akad., 1887, p. 48, Nagasaki.

Head $2\frac{2}{3}$; depth 3; dorsal rays 14; anal rays 12. Body rather stout, the tail shortish, the distance from vent to base of caudal less than half the distance to tip of snout; lateral fold wanting or reduced to a trace; skin everywhere smooth, the back with scattered papillæ; fins falcate, the caudal lunate, the anal $1\frac{1}{2}$ in head. Color purplish brown above, white below; a large blackish blotch behind pectoral; papillæ pale. (Schlegel.)

Coast of Kiusiu; not seen by us. Said to be taken at Nagasaki in winter. (πορφύρεος, purple.)

7. SPHEROIDES RUBRIPES (Schlegel).

MABUKU (TRUE PUFFER), TORABUKU (TIGER PUFFER), YANAGIBUKU (WILLOW PUFFER).

Tetrodon rubripes SCHLEGEL, Fauna Japonica, 1847, p. 283, pl. CXXIII, fig. 1, Nagasaki.—GÜNTHER, Cat. Fish., VIII, 1870, p. 279, Nagasaki.—NYSTROM, Handl. Svensk. Vet. Ak., 1887, p. 48, Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 2, Rikiuzen, Kaga.

Gastrophysus rubripes BLEEKER, Act. Soc. Indo-Nederl., Japan, VI, p. 68.

Lagocephalus rubripes JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 360, Tokyo.

Head 3 in length; depth $3\frac{1}{2}$; depth of caudal peduncle $3\frac{3}{8}$ in head; eye 8; snout $2\frac{1}{2}$; interorbital space $2\frac{2}{5}$; dorsal rays 14; anal rays 13.

Body rather stout, the caudal peduncle not very slender, compressed laterally. Head large, nearly square, in transverse outline, its length almost equal to distance between head and insertion of dorsal; interorbital space broad, flat. Eye small, $3\frac{1}{2}$ in snout. Nostrils separate, located almost transversely in an oval elevation; about an eye's diameter from eye. Teeth rather pointed anteriorly, the cutting edge concave; groove between the upper ones well defined, the ridges prominent; lower teeth wider than the upper ones. Inner flap of gill opening exposed.

Latter fold of body rather distinct posteriorly. A line of mucous pores extends from a point on the snout backward, below and close to the eye, bends upward behind the eye to a point above the gill-opening, from which point a branch crosses the occiput to meet the line of the opposite side; thence backward along the upper part of the side of body and caudal peduncle and slopes downward to middle of base of caudal fin; from a point behind eye a branch runs downward, disappearing on the throat; from behind the origin of this branch a line extends upward, bending forward above the eye and downward posterior to the nostril, joining the line first mentioned; no inclosed quadrangular space behind eye; snout with a transverse line above; a line passes backward from chin on each side and disappears on the breast; an indistinct line extends from below pectoral backward above base of anal to caudal fin. Back with rather small prickles from interorbital space to near insertion of dorsal fin; under parts with slightly larger prickles from just behind chin to vent; other parts of head and body naked.

Dorsal and anal rather pointed, not falcate, both of about the same height, 2 in head; dorsal inserted a little in advance of anal. Caudal truncate, $1\frac{3}{8}$ in head. Pectoral convex posteriorly, about 3 in head.

Color dark brown above, white or yellowish below; a large black ocellated blotch behind the pectoral; another at base of dorsal, extending on the fin; two or three smaller blotches faintly ocellate behind the pectoral blotch; caudal blackish; lower fins orange in life; no horizontal stripes on sides of body.

Described from a specimen about 350 mm. long, collected at Wakanoura. Younger examples about 200 mm. long, have small pale spots on the back and have the post-pectoral row of faintly ocellate spots absent; otherwise they are colored as the adult, with the exception that the large ocellate spot behind pectoral is more conspicuous. Young of 70 or 80 mm. length, gray, with five dark cross bands above, besides dark clouds; black blotches obscure.

Length 450 to 500 mm. Coast of southern Japan; not rare. Our four specimens from Tokyo and Wakanoura. It is one of the most strongly marked species. (*ruber*, red; *pes*, foot.)

8. SPHEROIDES XANTHOPTERUS (Schlegel).

Tetrodon xanthopterus SCHLEGEL, Fauna Japonica, 1847, p. 284, pl. cxxv, fig. 1, Nagasaki.—NYSTROM, Handl. Svensk. Vet. Akad., 1887, p. 48, Nagasaki.

Gastrophysus xanthopterus BLEEKER, Act. Soc. Indo-Nederl., Japan, 1852, VI, p. 68.

Head $3\frac{3}{8}$ in length; depth $3\frac{1}{2}$; dorsal rays 16; anal rays 13.

Length of head less than distance between head and insertion of dorsal; interorbital space broad, $1\frac{2}{3}$ in head. Teeth bluntly pointed before, the cutting edge concave; groove between teeth prominent, the ridge on either side of groove low. Back prickly from nostrils to dorsal fin; abdomen with rather long, sharp prickles; sides and tail smooth. Lateral fold obscure. Dorsal and anal rather high and falcate. Caudal moderately lunate.

Color bluish; sides silvery, the back with cross shades or bands; 3 or 4 oblique streaks behind pectorals, besides some roundish blotches; sides of body and tail with 3 horizontal stripes, the upper fading into the color of the back, the stripes oblique at the anterior end. Base of dorsal and pectorals dusky; fins yellow. The dark markings behind the pectorals vary, even in the same fish.

Length 400 or 500 mm. Southern Japan; rare. A single stuffed specimen obtained by us at Nagasaki.

It is regarded by Dr. Günther as a variation of *S. rubripes*, but the coloration is markedly different and the fins are higher and more acute. (*ξανθός*, yellow; *πτερόν*, fin.)

9. SPHEROIDES PARDALIS (Schlegel).

Tetrodon pardalis SCHLEGEL, Fauna Japonica, p. 282, pl. cxxi, fig. 2, Nagasaki.—

GÜNTHER, Cat. Fish., VIII, 1870, p. 281, Nagasaki.—NYSTROM, Handl. Svensk. Vet. Ak., 1887, p. 48, Nagasaki.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 360, Tokyo.

Head 3 in length; depth $3\frac{1}{2}$; depth of caudal peduncle $3\frac{1}{2}$ in head; eye $5\frac{1}{3}$; snout, $2\frac{2}{3}$; interorbital space $2\frac{1}{3}$; dorsal rays 10 or 11; anal rays 8 or 9.

Body rather robust; caudal peduncle conical, its length $1\frac{1}{2}$ in head; length of head somewhat less than distance between gill-opening and

insertion of dorsal. Eye 2 in snout; interorbital space concave. Nostrils separate, placed laterally in an oval elevation. Teeth bluntly pointed in front, the cutting edges slightly concave; suture without a deep groove, ridges on either side not prominent. Inner fold of gill-opening slightly exposed.

Lateral fold perceptible only posteriorly, where it is rather obscure. Lines of mucous pores like those of *S. rubripes*; skin soft, without prickles, almost entirely covered with small elevations resembling embedded scales. Fins low, about $2\frac{1}{8}$ in head, not falcate, the posterior edges convex. Caudal $1\frac{2}{5}$ in head, rounded posteriorly. Pectoral short, $2\frac{1}{2}$ in head.

Color brownish, rather dark; back and sides covered with round, blackish spots, somewhat smaller than the pupil; the interspaces not so wide as the spots; no large black spot above tip of pectoral or at base of dorsal. Fins dull orange; dorsal dusky; caudal blackish.

Coasts of Japan, rather common, reaching a length of about 380 mm. It varies somewhat in markings, but is easily distinguished from related species by the black spots. Our specimens are from Tokyo, Misaki, Matsushima, Onomichi, and Nagasaki. (παρδαλις, leopard.)

10. SPHEROIDES ABBOTTI Jordan and Snyder, new species.

Head $2\frac{2}{5}$ in length; depth 4; depth of caudal peduncle 4 in head; eye 6; snout $2\frac{1}{6}$; interorbital space $2\frac{1}{2}$; dorsal rays 13; anal rays 12.

Body rather broad, robust, tapering posteriorly to the small, cylindrical, caudal peduncle, which is about equal in length to head; length



FIG. 3.—SPHEROIDES ABBOTTI.

of head considerably less than distance between gill-opening and insertion of dorsal; head nearly square in cross section; eye small, about half way between tip of snout and gill-opening; interorbital space broad, flat; distance between eyes about $3\frac{1}{2}$ times their diameter; jaws equal; teeth with scarcely perceptible ridges in front, the suture without a deep groove; not pointed anteriorly, the cutting edges almost

straight; inner flap at gill-opening equal in length to the outer, protruding a little; nostrils separate, in an oval elevation.

Lateral fold present. A line of mucous pores extending from a point behind the mouth backward, below, and close to the eye, passing in a broad curve above the pectoral, bending downward and running to the middle of base of caudal; a branch passing over nape just above gill-opening; another leaving the lateral line behind the eye, going downward and disappearing on the throat; a third, having its origin immediately behind the latter, going upward and forward, passing downward close behind the nostrils, and joining the lateral line; a branch crossing the snout above; a line extending along side of body, below lateral fold, from a point below tip of pectoral to base of caudal; no inclosed quadrangular space behind eye. Skin smooth.

Dorsal and anal fins pointed, the edges straight or slightly concave; of about equal height; $1\frac{3}{4}$ in head. Caudal $1\frac{3}{8}$ in head, subtruncate, the upper lobe slightly pointed, the lower somewhat rounded. Pectoral $2\frac{1}{4}$ in head; of 13 rays.

Color light gray, abruptly white below; back covered with close-set black spots mostly smaller than the pupil and broader than the interspaces which form reticulations around them; numerous small spots below the eye; spots largest on upper part of tail, some of them confluent; spots on upper part and below base of dorsal mostly confluent, forming elongate blotches. Caudal dusky posteriorly; edged above and below with pale; other fins grayish.

Tokyo Bay. Known from one specimen about 325 mm. long. Type No. 6523, Leland Stanford Junior University Museum.

It is distinguished from *S. pardalis* by the smaller, closer set spots, the general gray coloration, and the more concave caudal. From *S. stictonotus* it differs in color, in having smooth skin, less falcate fins, and fewer dorsal and anal rays. (Named for James Francis Abbott, of Hachiman, Japan, formerly of Leland Stanford Junior University, in recognition of his studies of Japanese animals.)

II. SPHEROIDES EXASCURUS Jordan and Snyder, new species.

Head $3\frac{1}{2}$ in length, depth $4\frac{1}{8}$; depth of caudal peduncle $3\frac{1}{2}$ in head; eye 4; snout $2\frac{2}{3}$; interorbital space $2\frac{1}{8}$; dorsal rays 12; anal rays 12.

Body moderately elongate, not broadened anteriorly; caudal peduncle not compressed, its length slightly less than that of head; length of head much less than distance between gill opening and insertion of dorsal. Eye large, $1\frac{1}{2}$ in snout. Interorbital space concave; distance between eyes a little more than twice their diameter. Nostrils separate, in an oval elevation. Teeth bluntly pointed anteriorly, the cutting edges concave, the suture without a deep groove; ridges on either side of groove scarcely perceptible. Lower jaw projecting beyond the upper.

Skin smooth; a few small, deeply imbedded prickles on the breast and belly. Lines of mucous pores distinct; the lateral line extending from a point behind the mouth backward below and close to the eye, passing in a broad curve above the pectoral, bending downward and running to the middle of base of caudal; a branch passing over nape just above gill opening; another leaving the lateral line at a point close behind eye, going downward and disappearing on the throat; a third having its origin immediately before the latter, going upward and forward, passing downward close behind the nostrils and joining the lateral line; no inclosed quadrangular space behind eye; a branch crossing the snout above; a line originating near the angle of mouth, extending downward along the chin; curving backward along throat and bending upward to near base of pectoral; another beginning below and a little before the end of the latter, running backward, curving upward over anal, and extending to base of caudal.

Fins high, the dorsal pointed, its posterior edge straight, the longest

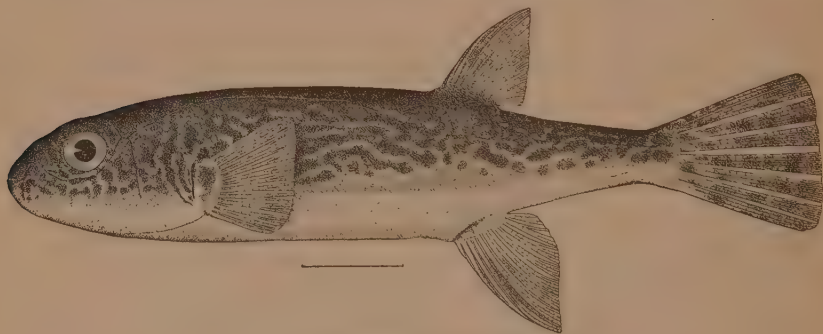


FIG. 4.—SPHEROIDES EXASCURUS.

rays $1\frac{1}{2}$ in head; anal similar in shape, slightly higher than dorsal. Caudal subtruncate, somewhat rounded posteriorly. Pectoral about $2\frac{1}{2}$ in head; of 14 rays.

Dark gray above, the color ending abruptly at the lateral fold; belly white; back blackish, with obscure grayish vermiculations; sides with very distinct, gray reticulations around irregular black spots, some of which are as large as pupil; sides of head very distinctly marked; a large black spot on base of pectoral; no distinct black blotch behind pectoral or below dorsal; dorsal with dark clouds; caudal with its rays distinctly spotted and reticulated like sides of body; gray area of sides extending below the dark spots.

Misaki; described from a fine specimen about 200 mm. long. Type No. 6524, Leland Stanford Junior University Museum. The species is related to *S. abbotti*, but differs from that and all others in its peculiar markings and especially in the extension of the spots and streaks on the caudal fin.

(ἐξασκέω, to adorn; οὐρά, tail.)

12. SPHEROIDES OCELLATUS (Osbeck).

Tetrodon ocellatus OSBECK, Iter Chinensis, 1757, p. 226; English ed. I, p. 364; II, p. 331, Canton.—LINNÆUS, Syst. Nat., 12th ed., p. 411, after Osbeck.—RICHARDSON, Voyage Sulphur, 1843, p. 120, pl. LVIII, figs. 1, 2; Canton, Japan.—GÜNTHER, Cat. Fish., VIII, 1870, p. 279, China.

Head 3; depth 3. D. about 14; A. 14. Body rather robust, covered with minute spines from near nostrils to dorsal fin; abdomen entirely covered with similar spines, sides naked; dorsal and anal low, slightly falcate; lateral ridge obscure; caudal truncate; upper teeth without ridge in front; olivaceous, sides silvery, young with round pale spots; a large black spot behind pectoral on each side, this connected with its fellow by a black cross band over the back; this band and the spots edged all around by white; a black, white-edged blotch at base of dorsal. Length about a foot. (Günther); (Richardson).

Coasts of China, mentioned by Richardson as from Japan, where it is probably rare; not seen by us. Common about Canton. (*Ocellatus*, ocellate.)

13. SPHEROIDES ALBOPLUMBEUS (Richardson).

NAGOYABUKU (NAGOYA PUFFER); KOMONBUKU (SMALL MARBLED PUFFER); SHIWOSAIBUKU (ESTUARY PUFFER).

Tetraodon albolunbeus RICHARDSON, Voy. Sulphur, Ichth., 1844, p. 121, pl. LVIII, figs. 6, 7, Canton; Ichth. China, p. 199, Canton.—BLEEKER, Atlas Gymnodontes, p. 62, pl. I, fig. 1, Sumatra, Borneo, Java.

Gastrophysus albolunbeus BLEEKER, Nat. Tydskr. Nederl. Ind., VII, p. 104.

Lagocephalus albolunbeus JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 360, Tokyo.

Tetrodon oblongus var. *albolunbeus* GÜNTHER, Cat. Fish., VIII., p. 278, Sumatra, China, Japan.—ISHIKAWA, Prel. Cat., 1897, p. 2, Izu, Riukiu, Kiusiu, Tokyo.

Tetrodon pectilodontus SCHLEGEL, Fauna Jap., 1847, p. 279, pl. cxxvi, fig. 2, Nagasaki.

Tetrodon niveatus BREVOORT, Japan. Fish., 1856, p. 284, Shimoda.

? *Tetrodon hartlandi* BIANCONI, Mem. Accad. Bologna, VI, p. 146, pl. II, fig. 1, Mozambique.

? *Gastrophysus microphthalmus* BLYTH, Journ. As. Soc. Bengal, XXIX, 1867, p. 174, Sifang.

Head $3\frac{1}{4}$ in length, depth $3\frac{3}{8}$; depth of caudal peduncle $3\frac{3}{8}$ in head; eye $5\frac{2}{5}$; snout $2\frac{1}{2}$; interorbital space 3; dorsal rays 12; anal rays 11.

Body rather elongate, the dorsal contour little elevated; caudal peduncle not compressed, its length $1\frac{1}{4}$ in head; length of head much less than distance between gill opening and base of caudal. Eye $2\frac{1}{3}$ in snout; interorbital space broad, flat. Nostrils in elevated, oblong, papillæ, the openings lateral. Teeth scarcely pointed before, the cutting edges somewhat concave; suture without groove; no vertical ridges on either side of suture. Inner flap at gill opening exposed; width of gill opening equal to base of pectoral.

Lateral fold prominent. Lines of mucous pores as described in *S. abbotti*, with the addition of one extending from chin backward and

upward to near base of pectoral. Skin of back and belly covered with prickles; the two areas confluent both before and behind pectorals.

Color very much as in *S. vermicularis*; grayish black above with numerous round, pale spots which are larger, more confluent, and more irregular on sides, none of them sharply defined or stellate, most of them broader than the interspaces; a dark blotch behind pectoral; another at base of dorsal; the dark blotches more apparent on young individuals; caudal dusky toward tip; other fins more or less dusky.

Coasts of Japan, especially southward, generally common. Our specimens are all small, none over 160 mm. in length. They are from Aomori, Tokyo, Wakanoura, Onomichi, and Tsuruga.

Except for the prickly back and sides, this species is scarcely different from *Spheroides vermicularis*. Our specimens represent *Tetraodon paxilonotus* Schlegel, which seems to be identical with the Chinese species called *S. alboplumbeus*. *Spheroides oblongus* of the East Indies is different in color from any of these. *Tetrodon niveatus* from Shimoda with "many small blotches of bluish white" must be the present species rather than *S. niphobles*, which has small stellate spots of pure white.

(*Albus*, white; *plumbeus*, lead color.)

14. SPHEROIDES VERMICULARIS (Schlegel).

MABUKU (TRUE PUFFER). SHIWOSAIBUKU (ESTUARY PUFFER).

Stachelloser Aufblaser aus Nagasaki KRUSENSTERN, Reise, Atlas, pl. LI, fig. 1.

Tetrodon vermicularis SCHLEGEL, Fauna Japonica, 1847, p. 278, pl. cxxiv, fig. 1.

Nagasaki.—GÜNTHER, Cat. Fish., VIII, 1870, p. 280, after Schlegel.—ISHIKAWA, Prel. Cat., 1897, p. 2, Esashi, Tokyo, Boshu.

Gastrophysus vermicularis BLEEKER, Verh. Bat. Gen., Japan, XXV, p. 125.

Head, $3\frac{1}{4}$ in length; depth $3\frac{1}{2}$; depth of caudal peduncle $3\frac{1}{2}$ in head; eye $5\frac{1}{2}$; snout $2\frac{2}{5}$; interorbital space $2\frac{2}{5}$; dorsal rays 12; anal rays 12.

Body somewhat elongate, the caudal peduncle not compressed, its length $1\frac{1}{2}$ in head; length of head considerably less than distance between gill opening and insertion of dorsal fin. Eye $2\frac{1}{2}$ in head; interorbital space flat. Nostrils in an oblong elevation, not tubular. Teeth scarcely pointed anteriorly, the cutting edges concave; no conspicuous depression along suture, and no vertical ridge on either side. Width of gill opening equal to that of base of pectoral, the inner flap exposed somewhat.

Lateral fold well developed. Lines of mucous pores not very distinct, arranged as in *S. abbotti*. Skin smooth.

Dorsal and anal $1\frac{1}{2}$ in head, pointed; the anal somewhat falcate. Caudal truncate $1\frac{2}{3}$ in head. Pectoral 2 in head, the upper angle rather acute, the lower rounded.

Color dark, with rounded or oblong irregular bluish white spots above, which are confluent along sides into larger, elongate spots and vermiculations which are smaller on head and middle of back; a large dark blotch behind pectoral; traces of a dusky spot below dorsal; caudal dusky posteriorly; other fins with a little dusky; the anal often without dark color. The ground color is sometimes gray; in other cases almost black. There are some variations in amount of pale markings.

Southern Japan, rather common. Known from the other entirely smooth species by the vaguely defined vermiculate pale spots, which are larger along the sides.

Here described from a specimen from Kobe; numerous others are from Tokyo, Misaki, Tsuruga, and Nagasaki. The species seems to reach a small size only, and none show any signs of prickles.

(*Vermicularis*, with worm tracks.)

15. SPHEROIDES BOREALIS Jordan and Snyder, new species.

Head $3\frac{1}{4}$ in length; depth $4\frac{1}{4}$; depth of caudal peduncle $4\frac{1}{2}$ in head; eye $5\frac{1}{2}$; snout $2\frac{1}{4}$; interorbital space $3\frac{2}{5}$, dorsal rays 13; anal rays 11.



FIG. 5.—SPHEROIDES BOREALIS.

Body moderately elongate, the dorsal contour little elevated; the caudal peduncle narrow, not compressed, its length contained about $1\frac{1}{3}$ in head. Length of head much less than space between gill-opening and insertion of dorsal; interorbital space slightly convex. Eye $2\frac{2}{3}$ in snout. Nostrils located in an oval elevation. Jaws equal. Teeth not pointed anteriorly, the cutting edges straight; suture between teeth without deep groove, the vertical ridges on either side of suture evident though not prominent. Gill opening not quite so wide as base of pectoral, the inner flap exposed along its edge. Lateral fold present. Skin without prickles. Lines of mucous pores indistinct; lateral line running from snout backward below eye, curving upward over the pectoral, passing downward and backward to base of caudal fin; a branch passing over the nape above gill openings; a branch pass-

ing from behind eye, upward and forward, curving downward between nostril and eye, and joining the lateral line; another branch, having its origin posterior to the eye, coinciding with the latter, passing downward and disappearing on the throat; a branch passing over the snout just anterior to the nostrils; a line extending downward and backward from chin to a point near base of pectoral; another, having its origin below and a little anterior to the latter, running backward below lateral fold to base of caudal.

Dorsal and anal pointed, the latter slightly falcate, the height about $1\frac{3}{4}$ in head. Caudal truncate, its length $1\frac{1}{2}$ in head. Pectoral slightly rounded posteriorly, $2\frac{2}{5}$ in head, the number of rays 14.

Color dark brown above, with faint, rounded, pale spots, sometimes confluent in vermiculations, around darker spots, pale spots, those on back a little smaller than those on sides, none of the spots white and none sharply defined. A round jet-black spot, edged with pale above tip of pectoral, this well defined and larger than eye, not meeting its fellow across the back; a large black blotch on and below base of dorsal; dorsal and caudal largely dusky toward tip; pectoral and anal pale.

Here described from a specimen about 180 mm. long, from Mororan, Hokkaido. Type No. 6525, Leland Stanford Junior University Museum.

This species is very close to *Spheroides vermicularis*, but the body is stouter, the bony interorbital area narrower, and the spots are more distinctly rounded, when vermiculate surrounding darker spots of the ground color. It is extremely abundant in northern Japan. Our very many specimens, none more than 6 inches long, are from Otaru, Mororan, Hakodate, Aomori, Same-Minato, and Matsushima.

(*Borealis*, northern.)

Measurements of Spheroides borealis.

	Mororan, Hokkaido.				Hakodate, Hokkaido.			
Length in millimeters.....	151	142	142	98	131	113	100	54
Depth expressed in hundredths of length ..	26 $\frac{1}{2}$	25	26	27	26	26	25	28
Depth of caudal peduncle.....	7	7	7 $\frac{1}{2}$	7	7 $\frac{1}{2}$	8	7	8
Length of caudal peduncle.....	26	25	25 $\frac{1}{2}$	24	25 $\frac{1}{2}$	23 $\frac{1}{2}$	25	24
Length of head.....	31	31	32	32	32 $\frac{1}{2}$	31	32	35
Width of interorbital space.....	9	9 $\frac{1}{2}$	9	9	9	8	7	6 $\frac{1}{2}$
Length of snout.....	15	14	13	14	14	13 $\frac{1}{2}$	13	15
Diameter of orbit.....	6	6	6	6 $\frac{1}{2}$	7	6 $\frac{1}{2}$	7	7 $\frac{1}{2}$
Distance from snout to dorsal fin.....	65	64 $\frac{1}{2}$	65	67	67	65 $\frac{1}{2}$	66	69
Height of longest dorsal rays.....	18 $\frac{1}{2}$	18 $\frac{1}{2}$	16 $\frac{1}{2}$	18	17	17	17	17 $\frac{1}{2}$
Height of longest anal rays.....	20	18	17 $\frac{1}{2}$	19	17	16 $\frac{1}{2}$	18	17
Length of caudal fin.....	18	19	19	22	19	21	19	22
Number of rays in dorsal fin.....	13	13	13	14	13	13	13	13
Number of rays in anal fin.....	11	12	11	11	12	11	12	11

16. SPHEROIDES NIPHOBLES Jordan and Snyder, new species.

Head $3\frac{1}{5}$ in length; depth $3\frac{4}{5}$; depth of caudal peduncle $3\frac{3}{5}$ in head; eye 5; snout $2\frac{1}{2}$; interorbital space 3; dorsal rays 12; anal rays 10.

Body rather robust, almost as wide as deep; caudal peduncle conical, not compressed, its length $1\frac{2}{5}$ in head. Head much shorter than distance between gill opening and insertion of dorsal. Eye about $1\frac{1}{2}$ in snout; interorbital area flat, the space between eyes $2\frac{1}{2}$ times their diameter. Nostrils in low, oblong, elevations. Teeth obtusely pointed, the cutting edges concave; sutures between teeth without groove, the elevations on either side scarcely noticeable; width of gill-opening somewhat less than that of base of pectoral, the edge of inner flap exposed.

Small prickles on nape, anterior part of back, and on belly, the skin elsewhere smooth. Lateral fold rather prominent posteriorly. Lines of mucous pores rather distinct; arranged as in *S. borealis*.

Dorsal and anal fins rounded, their height 2 in head. Caudal convex posteriorly; its length $1\frac{1}{2}$ in head. Pectoral $2\frac{1}{2}$ in head, its posterior edge convex; number of rays, 14.



FIG. 6.—SPHEROIDES NIPHOBLES.

Color dark grayish, everywhere above covered with sharply defined white stellate spots; nearly all round, narrower than their interspaces, and not enlarged or confluent along sides; a distinct black blotch above pectoral, with white below it, but not surrounded by white; a black blotch below soft dorsal; caudal dusky at tip; fins otherwise pale.

Described from type No. 6526, Leland Stanford Junior University Museum; from Tokyo, Japan.

Our numerous specimens are from Tokyo, Misaki, Wakanoura, Tsuruga, and Nagasaki. On some of these the dark color on the side is bordered by a dusky shade. In a few the lateral spots are a little larger than those on the back. In all the space just below eye is without distinct spots.

This species is very close to *S. alboplumbeus*, but is smoother, and differs from all the others in the stellate character of the spots, which are distinctly white.

(νιφοβλής, snowed on, from the stellate spots.)

Measurements of Spheroides niphobles.

	Tokyo, Japan.				
Length in millimeters.....	119	120	100	98	98
Depth expressed in hundredths of length.....	28	28	26½	26	29
Depth of caudal peduncle.....	9	8½	8½	8	8½
Length of caudal peduncle.....	24	24½	25	24	22
Length of head.....	33	32	32	32	34
Width of interorbital space.....	10½	9	10	8½	10
Length of snout.....	14½	12½	14	14	16
Diameter of orbit.....	8	7	8	7	7
Distance from snout to dorsal fin.....	69	68	69	67	70
Height of longest dorsal rays.....	18	18	17½	18	18
Height of longest anal rays.....	19	17½	17	17½	20
Length of caudal fin.....	22	22	23½	21	24
Number of rays in dorsal fin.....	12	12	12	12	12
Number of rays in anal fin.....	10	10	10	10	10

17. SPHEROIDES RICHEI (Fréminville).

NAGOYABUKU.

Tetrodon richiei FRÉMINVILLE, Nouv. Bull. Philom., II, p. 250, pl. iv, fig. 2.—BLEEKER, Atlas Ichth. Gymnodontes, p. 461, pl. ix, fig. 3, Derwent, Hobart-town, Tasmania.—GÜNTHER, Cat. Fish., VIII, 1870, p. 285, New Zealand, South Australia, Hobarttown.—ISHIKAWA, Prel. Cat., 1897, p. 2, Kagoshima.

Head $3\frac{1}{4}$; depth $3\frac{2}{5}$; D. 9; A. 10.

Body from the lips, above, below, and on both sides, closely covered with small spines; caudal peduncle smooth; snout obtuse; interorbital space broad; orbit with a free fold for its whole circumference; no lateral fold on body or tail.

Color greenish, whitish below, with a few large irregular black spots or blotches above, some of these about as large as eye.

Coasts of Australia and New Zealand (Bleeker); a specimen from Kagoshima, referred to this species by Dr. Ishikawa, is in the Imperial Museum of Tokyo. This identification is by no means certain.

18. SPHEROIDES CHRYSOPS (Hilgendorf).

Tetrodon chrysops HILGENDORF, Sitzgber. Naturf. Freunde, May 20, 1879, p. 80, Tokyo, type No. 10625, Mus. Berl.

Head $2\frac{1}{2}$ in length; depth $2\frac{1}{2}$; depth of caudal peduncle 3 in head; eye $5\frac{1}{2}$; snout $2\frac{2}{3}$, interorbital space $2\frac{2}{3}$; dorsal rays 10; anal rays 9.

Body very robust, the caudal peduncle somewhat compressed, its length about $1\frac{1}{2}$ in head. Head large, its length equal to distance between gill opening and insertion of dorsal (not quite so long in one specimen). Interorbital space somewhat concave, occasionally flat or slightly convex. Eye moderate, 2 or $2\frac{1}{2}$ in snout. Nostrils with tubes, the openings lateral. Teeth not pointed in front, the cutting edges straight or somewhat concave, the suture without a deep groove, no ridges bordering suture. Gill opening small, not extending above upper edge of base of fin, the inner or secondary flap slightly exposed.

Body naked, the skin covered with minute pits. Lines of mucous

pores similar to those of *S. abbotti*, except that the upper and lower branches just behind the eye are concurrent, and the line extending from the chin backward is very indistinct.

Dorsal and anal of equal height; $1\frac{3}{4}$ in head; rounded. Caudal $1\frac{1}{2}$; rounded posteriorly. Pectoral about 2 in head; its posterior edge convex.

Pinkish brown above or chocolate color, becoming gradually paler below; back with scattered, very irregular black spots and mottlings, all smaller than eye; no large black blotches behind pectoral or below dorsal; fins plain dusky; the caudal tipped with blackish in one specimen; iris yellow.



FIG. 7.—SPHEROIDES CHRYSOPS.

Coast of Japan, here described from four specimens, the largest about 300 mm. long, from Tokyo market and from Misaki.

It is a well marked species, allied to *S. pardalis*, but known at once by its color and its plump form.

(χρυσός, gold; ὤψ, eye.)

3. TETRAODON Linnæus.

Tetraodon LINNÆUS, Syst. Nat., 10th ed., 1758 (*lineatus*).

Les Ovoides LACÉPÈDE, Hist. Nat. Poiss., I, 1797, p. 256 (*fascé*; French names only); based on front view of *Tetraodon stellatus*.

Ovum BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 530 (*commersoni*); after Lacépède; name preoccupied in mollusks.

Ovoides DUMÉRIL, Zoologie Analytique, 1806; after Lacépède.

Oonidus RAFINESQUE, Analyse de la Nature, 1815, p. 90 (substitute for *Ovum*).

Arothron MÜLLER, Abh. Berl. Akad., 1839, p. 252 (*testudinarius*=*reticularis*).

Les Epipedorhynques (*Epipedorhynchus*) BIBRON, Rev. Zool., 1855, p. 279.

Les Dilobomyctères (*Dilobomycter*) BIBRON, Revue Zool., 1855, p. 279 (*reticularis*, etc).

Les Dichotomyctères (*Dichotomycter*) BIBRON, Rev. Zool., 1855, p. 279 (*fluviatilis*; no diagnosis).

Brachycephalus HOLLARD, Gymnodontes, 1867, p. 324.

Crayracion BLEEKER, Atlas Gymnod., p. 65, after Klein, 1742; type *spengleri*, erroneously supposed to belong to this group.

Body rather robust, the skin usually more or less prickly. Nostril on each side with a tentacle, bifid to the base, its tips without opening, the branches of the large olfactory nerve ending in cup-like depressions along the inner edges of the two flattish lobes. Dorsal and anal fins rounded, each of 7 to 14 rays; the dorsal more or less in front of anal; caudal rounded. Vertebrae usually $8+10=18$. A ring muscle about the eye forming eyelids. Species numerous, chiefly of the tropical Pacific; distinguished from *Spheroides* by the solid nasal tentacles. Most or all of our species belong to the section or genus *Ovoides*, distinguished by the form of the postfrontals and prefrontals, which are deflected to describe the segment of a circle. The value of this character should be tested before *Ovoides* is recognized as a distinct genus. (*τέτρα*, four; *ὀδούς*, tooth.)

- a. TETRAODON: Dorsal and anal rather large, each of about 14 rays; body everywhere with round pale spots; belly paler than back *firmamentum*, 19.
- aa. OVOIDES: Dorsal and anal small, each of about 10 rays.
 - b. Spots on back black, darker than the ground color; spines on belly black; forehead broad, flattish; spines stiff *aërostaticus*, 20.
 - bb. Spots on back whitish or pale, paler than the ground color; spines on belly whitish, rather flexible.
 - c. Belly crossed by black parallel stripes with white interspaces, the stripes fading with age; interorbital area concave; gill-opening black.... *hispidus*, 21.
 - cc. Belly covered with round white spots on a dark background, like the back; interorbital area narrow, flattish; prickles very close-set..... *meleagris*, 22.

19. TETRAODON FIRMAMENTUM (Schlegel).

HOSHIFUKUTO (STARRY PUFFER).

Tetrodon firmamentum SCHLEGEL, Fauna Japonica, p. 280, pl. CXXVI, fig. 2, 1847, Nagasaki.—BLEEKER, Verh. Bat. Gen., Japan, XXVI, p. 124.—GÜNTHER, Cat. Fish., VIII, 1870, p. 299, Nagasaki.

Body rather elongate; small two-rooted spines covering every part, except snout and posterior part of caudal peduncle. Snout $2\frac{2}{3}$ in head, a little less than width of interorbital space, which is rather convex. Dorsal and anal higher than in other species, each of about 14 rays, the front of anal nearly under middle of dorsal; caudal long, truncate.

Color grayish above, paler below; the entire body and base of the caudal covered with ovate white spots, smaller than the eye and narrower than the interspaces of the ground color. Length, a foot.

Nagasaki; known only from the original types; not seen by us.

(*Firmamentum*, the sky; from the starry spots.)

20. TETRAODON AEROSTATICUS (Jenyns).

Tetrodon lineatus BLOCH, Ausländ. Fische, I, 1785, p. 128, pl. CXLi (not of Linneus), and of various authors.—SCHLEGEL, Fauna Japonica, 1847, p. 287, pl. CXXV, fig. 2, Nagasaki.

Arothron lineatus BLEEKER, Verh. Bat. Gen., Japan, p. 40.

Crayracion lineatus BLEEKER, Atlas Gymnodontes, p. 70, pl. II, fig. 1; pl. VIII, fig. 1, Bali, Singapore, Celebes, Amboyna.

Tetrodon aerostaticus JENYNS, Voy. Beagle, p. 152, 1842, locality unknown.

Head, $2\frac{1}{2}$ in length; depth of caudal peduncle, $3\frac{1}{2}$ in head; eye, $7\frac{1}{2}$; snout, $2\frac{1}{4}$; interorbital space, $2\frac{3}{4}$; dorsal rays, 10; anal rays, 10.

Body short, broad, and very deep, the belly greatly inflatable; caudal peduncle somewhat compressed, its length 3 in head. Eye small, $3\frac{1}{3}$ in snout. Interorbital space broad, flat, the distance between eyes 4 times their diameter. Mouth small, its width about 2 times diameter of eye. Cutting edges of teeth concave, the suture without deep groove, and without ridges on either side. Nostrils with bifid tentacles; no apparent openings. Gill-opening almost as wide as base of pectoral.

Lips, bases of fins, and caudal peduncle naked, the other parts of body covered with prominent spines; those of the upper parts and sides sharp, those of belly club-shaped.

Fins all rounded, the membranes thin; dorsal and anal about 3 in head, caudal 2 in head. Pectoral rays 19.

Color very dark brown; everywhere above with round, jet-black spots of different sizes, but all smaller than eye; belly with broad, black bands, more or less confluent and irregular, those anteriorly forming black reticulations around pale spots; vent black; base of pectoral and anal with black spots, the caudal spotted, the other fins plain.

East Indies; occasionally north to Japan; here described from a fine specimen taken at Houmoku, near Misaki, by Capt. Alan Owston. A smaller specimen, also from Misaki, shows no black spots above and the bands below are narrower, widely separated, and parallel. In both the spines are black, both on the light and dark ground color.

Dr. Günther unites this, with several other of Bleeker's species, under the name of *Tetrodon stellatus*. The oldest name, however, certainly belonging to the present form is *aerostaticus*. *Tetrodon stellatus* is figured as having the rather high dorsal, like the caudal, well spotted with black. It is, however, possible that *Tetraodon stellatus* is the adult of the same fish.

(*Aerostaticus*, resting in air as a balloon.)

21. TETRAODON HISPIDUS Linnæus.

? *Tetraodon hispidus* LINNÆUS, Syst. Nat., 10th ed., 1758, p. 333, China, after Lagerstrom (probably this species, the spots not indicated in Lagerstrom's figure); Syst. Nat., 12th ed., 1766, p. 411.—? BLOCH, Ausl. Fische, I, about 1786, p. 130, pl. CXLII, Coromandel.

Tetrodon hispidus GÜNTHER, Cat. Fish., VIII, 1870, p. 297, Red Sea, Zanzibar, Ceylon, Mozambique, Port Natal.

Tetrodon perspicillaris RÜPPELL, Atlas Fische, p. 63, Red Sea.

Tetrodon imphutus JENYNS, Voyage Beagle, Fish., 1842, p. 152, Vanikoro.

Crayracion imphutus BLEEKER, Atlas Gymnodontes, p. 71, pl. I, fig. 5, Sumatra, Cocos, Solor, Timor, Batjan, Amboyna, Banda.

Tetraodon laterna RICHARDSON, Voy. Sulphur, 1842, p. 124, pl. LXI, fig. 2, Canton, after an incorrect drawing by John Reeves.—RICHARDSON, Ichth. China, p. 199, Canton.

Arothron laterna BLEEKER, Enum. Pisc. Archip. Ind., p. 200.

Tetrodon hispidus (*semistriatus*) GÜNTHER, Cat. Fish., VIII, 1870, p. 297, Amboyna, Aneitum, Australia.

Head, $2\frac{3}{8}$ in length; depth of caudal peduncle, 3 in head; eye, 6; snout, $2\frac{1}{4}$; interorbital space, 3; dorsal rays, 10; anal rays, 10.

Body robust, the belly enormously distensible, caudal peduncle compressed; the length $2\frac{1}{2}$ in head. Length of head less than distance between gill opening and insertion of dorsal. Interorbital space flat or somewhat concave, the distance between eyes $3\frac{1}{2}$ times their diameter. Cutting edges of teeth concave; suture without a deep depression, on vertical ridges along its side. Gill opening not quite so wide as base of pectoral. Nostrils with bifid tentacles, without apparent openings.

Lips, upper part of snout, bases of fins, and caudal peduncle naked; other parts covered with prickles or short, slender spines; those of the upper parts very short and pointed; of the lower parts longer, pointed, and with a minute, fleshy bulb near the tip. Lines of mucous pores very indistinct; a line (encircling the eye) passing in a broad curve above pectoral, then bending downward and extending to base of caudal fin.

Fins small, their edges rounded; dorsal and anal, $3\frac{1}{2}$ in head; caudal, $1\frac{2}{3}$; pectoral, 3.

Color blackish gray, the upper parts with oblong or rounded pale spots about as large as pupil; interspaces wider than spots; a large black blotch surrounded by a white ring around base of pectoral and gill opening; chin dusky; belly whitish, with parallel stripes of black, which fade and grow narrower on the median part; caudal with small white spots; other fins pale or with a little dusky.

Smaller specimens have the pale spots above much more obscure, while the black stripes on the belly are very distinct. The upper stripes are most distinct and are deeper in color at intervals, leaving a trace of about 4 dark cross bars on the side.

In adult specimens, apparently of the same species, collected in Honolulu by Dr. O. P. Jenkins, the stripes on the belly are obsolete. In the young from the same locality they are very distinct.

East Indies, north to the Riukiu Islands. Here described from a specimen, $5\frac{1}{2}$ inches long, from Okinawa (Coll. Y. Koneyama), and from two others, each of which is about 4 inches long, from Ishigaki Islands (Yaeyama; Coll. Capt. Alan Owston). The larger specimen is evidently identical with Bleeker's *implutus* and Richardson's *laterna*. The synonymy of Rüppell we have taken from Dr. Günther. The unidentified description of *Tetrodon hispidus* seems to belong to this species. The type came from China and was marked by vague, dark cross bands, but no pale spots are figured.

22. TETRAODON MELEAGRIS Lacépède.

Tetrodon meleagris LACÉPÈDE, Hist. Nat. Poiss., I, 1799, pp. 476, 505; seas of Asia, on a drawing by Commerson.—RICHARDSON, Voyage Sulphur, Fish, p. 122, pl. XLVII, 57, figs. 1-3, locality unknown, probably China Seas; also notes a drawing from Tahiti by Solander.—GÜNTHER, Cat. Fish., VIII, 1870, p. 299, Richardson's type.

? *Arothron ophryas* COPE, Fishes Lesser Antilles, 1870, p. 479, Navigator Islands.

? *Ovoides ophryas* FOWLER, Proc. Ac. Nat. Sci. Phila., 1900, p. 528, pl. xx, fig. 2, after Cope's type.

? *Ovoides latifrons* JENKINS, Bull. U. S. Fish Comm., 1899 (June 8, 1901), p. 398. Honolulu.

Head, $2\frac{1}{2}$ in length; depth of caudal peduncle, $3\frac{1}{3}$ in head; eye, 8; snout, $2\frac{2}{5}$; interorbital space, $2\frac{1}{2}$; dorsal rays, 10; anal rays, 10.

Body robust, the belly capable of great inflation; dorsal contour evenly rounded, not much elevated; contour of snout slightly concave.

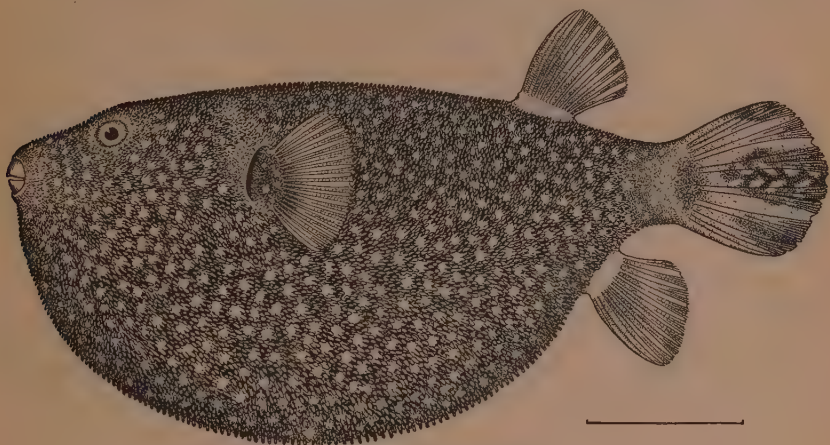


FIG 8.—TETRAODON MELEAGRIS.

Head large, its length less than distance between gill opening and insertion of dorsal fin; interorbital space somewhat convex. Eye small, the diameter about 3 in snout; a little nearer to tip of snout than to gill opening. Dental plates of about equal width, the suture without a deep groove, and without vertical ridges on either side. Gill opening not so wide as base of dorsal. Nostril with a bifid tentacle with 2 compressed flaps; no apparent opening.

Lines of mucous pores not evident except above eyes. Body everywhere except lips, border of gill openings, and bases of fins hispid with rather slender, thick-set spines; those of the back short and rather rigidly set; those below nearly twice as long and more easily depressed; the transition from shorter to longer spines gradual on the sides.

Fins with rounded edges; dorsal and anal of equal height, $2\frac{3}{5}$ in head; caudal, $1\frac{2}{3}$; pectoral, 2.

Color dark brown or blackish, the spines whitish; everywhere

covered with small, round, stellate, whitish spots, rather regularly placed, all narrower than pupil, and narrower than the interspaces. All the spots are round and those on sides of head, throat, and belly are largest. No bands on belly; base of pectoral black, with white spots; dorsal and anal dusky. Caudal spotted like the body.

Pacific Ocean.

One specimen from Okinawa, 125 mm. long, collected by Yonekichi Komeyama.

We identify this species with some doubt with *Tetraodon meleagris* as described, and as figured by Richardson. The only notable difference lies in the form of the pale spots, which are lenticular or oblong in *T. meleagris* and round in our specimen, as also in the specimens called *ophryas* and *latifrons*.

(*Meleagris*, a Guinea hen.)

Family III. TROPIDICHTHYIDÆ.

SHARP-NOSED PUFFERS.

This family includes small puffers, similar in external appearance to the Tetraodontidæ, but with the snout sharp and the back more or less compressed or ridge-like. The skeletal characters by which the group is defined are thus given by Dr. Gill: Medifrontals separated from the supraoccipital by the intervention of the sphenotics which are connected together and laterally expanded, but short; the prosethmoid prominent above, enlarged and narrowed forward. Vertebrae about 8 + 10. Head compressed, with a projecting, attenuated snout; dorsal and anal short, few-rayed. Nostrils wanting or little developed. Tropical seas; small species; none of them reaching a length of more than 6 inches.

a. Nostrils small, consisting of a raised rim with a small perforation

*Eumycterias*¹⁴.

4. EUMYCTERIAS Jenkins.

Eumycterias JENKINS, Bull. U. S. Fish Comm., 1899 (June 8, 1901), p. 399 (*büteniatus*).

This genus differs from *Tropidichthys* in the less complete atrophy of the nostrils. These are reduced each to a raised rim or small papilla with a small perforation like a pin-prick.

(εὔ, well; μυκτήρ, nostril.)

¹⁴The nostrils are entirely wanting in *Tropidichthys*, the other genus of this family. The following is the synonymy of *Tropidichthys*:

Canthigaster SWAINSON, Nat. Hist. Fishes, II, 1839, p. 194 (diagnosis only; no species mentioned).

Pylonotus SWAINSON, Nat. Hist. Fishes, II, 1839, p. 328 (*rostratus*); substitute for *Canthigaster*; not *Pylonotus*, a genus of Hymenoptera of prior date.

Prilonotus (Kaup MS.) RICHARDSON, Voyage Herald, 1854, p. 162 (*rostratus*; misprint).

Tropidichthys BLEEKER, Nat. Tyds. Nederl. Ind., IV, 1854 (*valentini*).

Anosmius PETERS, Wiegmann's Arch. 1855, p. 274 (*tenuiatus*).

Rhynchotus (BIBRON) HOLLARD, Études Gymnodontes, 1857, p. 320 (*peroni*).

23. EUMYCTERIAS RIVULATUS (Schlegel).

KITAMAKURA (SLEEPER WITH HEAD TO NORTH); YOKOBUKU (CROSSWISE PUFFER); AKAMEBUKU (RED-EYED PUFFER).

Tetrodon rivulatus SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 285, pl. cxxiv, fig. 3, Nagasaki.—GÜNTHER, Cat. Fish., VIII, 1870, p. 305 (copied).—ISHIKAWA, Prel. Cat., 1897, p. 2, Sagami, Tokyo.

Tetrodon grammatocephalus SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 286, pl. cxxvi, fig. 3, Nagasaki (young with obscure coloration).

? *Eumycterias biteniatus* JENKINS, Bull. U. S. Fish Comm., 1899 (June 8, 1901), p. 400. Honolulu.

Head $2\frac{2}{3}$ in length; depth $2\frac{2}{3}$; depth of caudal peduncle $2\frac{1}{2}$ in head; eye $4\frac{1}{3}$; snout $1\frac{1}{3}$; interorbital space $3\frac{2}{3}$; dorsal rays 10; anal rays 10.

Body robust, deep, compressed, the dorsal contour greatly elevated, the outline from snout to occiput straight, the ventral contour evenly rounded; caudal peduncle deep, compressed, its length $1\frac{1}{6}$ in head. Head triangular in outline, its length equal to distance between gill-opening and dorsal fin; interorbital area narrow, nearly flat. Eye oblong, $2\frac{1}{2}$ in snout. Snout long, pointed. Nostrils with a single tube in a small, round papilla. Teeth scarcely pointed anteriorly, the cutting edges straight, the suture without a deep groove; no vertical ridge on either side of groove. Width of gill-opening equal to one-half base of pectoral.

A median elevation or fold of the skin extending from chin to anal opening. Skin smooth or with embedded prickles on adult specimens (100 to 150 mm. long). Young individuals with prickles above and below. With increasing age the prickles sink into the thick skin and entirely disappear. In dried specimens they are present, having 3 roots.

Color, olivaceous above, bright violet below. Adults marked above with numerous narrow bright blue lines running in various directions on the nape and back, mostly longitudinal on front of snout, and on back of tail, and descending vertically or obliquely about the eye; besides these lines are numerous vermiculations, especially on body and tail, while the belly and sides are sprinkled with orange dots. These are especially numerous above and behind the chin and about the gill opening. Belly with blue spots. All these markings are variable and some of them fade in spirits. Dorsal blackish at base, otherwise pale; caudal dusky bluish, its base dusky above and below. Specimens of about 150 mm. are marked as above. Those of about 100 mm. have in addition a dark curved line before gill opening, the upper part of which extends backward toward caudal. Smaller ones show in addition two blackish lateral stripes, the one extending from the eye nearly to the caudal, the other from the tip of snout, below pectoral; dark streaks before and behind gill-opening. Still smaller ones lack streaks and spots and have two black lateral bands, with a silvery interspace.

Some specimens of 100 mm. (Nagasaki), corresponding to *grammatocephalus*, lack streaks except about the eye, have no spots, the belly plain whitish, and the dark lateral streaks vaguely defined, the body mottled or blotched with paler.

Comparison of very many specimens from Tokyo, Misaki, Wakanoura, Kobe, and from Nagasaki leaves no doubt that all belong to a single species which varies much with age, as well as with the surrounding conditions. Additional variations arise in alcohol, which causes the fading of the violet and golden markings.

Southern Japan, common in shallow bays about rocks from Tokyo to Nagasaki. The description of *Eumycterias biteniatus* from Honolulu applies very well to a young specimen of this species.

(*Rivulatus*, having streaks like streams.)

Family IV. DIODONTIDÆ.

PORCUPINE FISHES.

Body short, broad, depressed above. Belly moderately inflatable; body covered everywhere except on the lips and caudal peduncle with spines, which are usually 2-rooted or 3-rooted at their bony base. Caudal peduncle short and slender. Mouth moderate, terminal, each jaw covered with a bony plate like the beak of a bird; these not divided by a median suture. Nostrils on each side forming a small tentacle, usually with 2 openings. Eye rather large, gill opening moderate, immediately in front of the pectoral, which is short, broad, and rounded. Dorsal and anal fins short, similar to each other, rounded in form and placed posteriorly. Sluggish fishes, living on the bottom among weeds and corals, in tropical seas. When disturbed, they swallow air and float belly upward on the water. Their capacity of inflation is very much less than that of the *Tetraodontidæ*, from which family they differ chiefly in the stronger armature and in having no division in the bony plate of either jaw. They are rarely used as food, being generally regarded as poisonous. The species are mostly well known in collections, the singular form having attracted the attention of travelers in the earliest times.

- a. Dermal ossifications mostly 2-rooted; the spines rather slender, but stiff and erectile. Nasal tentacle simple, with 2 lateral openings..... *Diodon*, 5.
- aa. Dermal ossifications all or nearly all 3-rooted, each with a short, stiff, immovable spine. Nasal tentacle simple, with 2 openings..... *Chilomycterus*, 6.

5. DIODON Linnæus.

Diodon LINNÆUS, Syst. Nat., 10th ed., 1758, p. 335 (*hystrix*).

Paradiodon BLEEKER, Atlas Ichth., Gymnodontes, 1867, p. 56 (*hystrix*); name a substitute for *Diodon*, transferred to another genus; the first species mentioned by Linnæus being *Diodon atinga*, which was therefore taken by Bleeker as the type.

Body robust, the belly moderately inflatable. Dermal spines strong, stiff, most of them 2-rooted and erectile, a few 3-rooted and therefore

immovable; both jaws entire; nasal tube simple, with 2 lateral openings. Pectorals broad, their margin undulate, the upper lobe longest; vertical fins rounded, the dorsal and anal short, posteriorly inserted, similar to each other. Tropical seas: the few species very widely distributed.

(*δῖς*, two; *ὀδούς*, tooth.)

24. *DIODON HOLACANTHUS* Linnæus.

HARISEMBON (THOUSAND-NEEDLES); *YATSUMEBUKU* (EIGHT-EYED PUFFER); *HARIFUKU* (NEEDLE PUFFER).

Ostracion oblongus holacanthus ARTEDI, Genera 60, No. 20, 1738, India.

Diodon holacanthus LINNÆUS, Syst. Nat., 10th ed., 1738, p. 335, after Artedi.

Diodon holacanthus JORDAN and EVERMANN, Fish. N. M. America, 1898, p. 1746, Florida Keys, La Paz.

Diodon liturosus SHAW, Gen'l Zool., 1806, V, p. 436, pl. 11, New Cytherea after *le diodon tacheté* of Lacépède.

Diodon spinosissimus CUVIER, Mém. Mus., IV, 1818, p. 134; no locality.

Diodon novemmaculatus CUVIER, Mém. Mus., IV, 1818, p. 134; no locality.—SCHLEGEL, Fauna Japonica, 1847, p. 289, pl. CXXVIII, fig. 2, Nagasaki.

Diodon sexmaculatus CUVIER, Mém. Mus., IV, 1818, p. 134, no locality.

Diodon multimaculatus CUVIER, Mém. Mus., IV, 1818, p. 134, no locality.

Diodon quadrimaculatus CUVIER, Mém. Mus., IV, 1818, p. 134, Otaiti.

Paradiodon quadrimaculatus BLEEKER, Atlas, Gymnodontes, 1867, p. 58, pl. VIII, fig. 2, Solor, Amboyna.

Diodon melanopsis KAUP, Wiegmann's Archiv., 1855, p. 228.

Diodon maculatus GÜNTHER, Cat. Fish., VIII, 1870, p. 307, St. Croix, Jamaica, Hawaii, China, Sulu Sea, Indian Ocean.—ISHIKAWA, Prel. Cat., 1897, p. 1, Tokyo, Miyako-Shima, Riukiu.

Eyes well behind line of angle of mouth. Frontal spines long, usually longer than post-pectoral spines, about twice as long as eye in adult; predorsal spines not shortened, 2-rooted, erectile; 14 to 17 spines in a series between snout and dorsal; post-pectoral spines not especially elongate, their development variable; dorsal rays usually 12; anal 12; pectoral broader than long, its upper lobe pointed, lower lobe rounded. Body marked with black spots and blotches irregular in size, usually a broad black bar from eye to eye, continued below eye as a narrow bar; a broad bar across occiput; a black blotch above each pectoral; a short bar in front of dorsal; another in which the dorsal is inserted; a blotch behind pectoral, and many small spots and blotches on upper parts; fins with few spots, usually unmarked in the young. Young (Misaki) with the belly spotted; adult with the belly white, or with few spots.

In all warm seas. Our Japanese specimens agree entirely with the description given by Jordan and Evermann, printed above. This species may be simply the young of the larger, equally cosmopolitan species, *Diodon hystrix*. In this form the frontal spines are smaller than those behind the pectorals. We have six specimens from Wakanaoura and two from Misaki.

6. CHILOMYCTERUS Bibron.

BURR-FISHES.

Chilomycterus BIBRON, in Barneville, Revue Zoologique, 1846, p. 40, (*reticulatus* = *tigrinus*).

Chilomycterus KAUP, Wieg. Archiv., 1847, p. 365 (*antennatus*).

Cyclichthys KAUP, Wieg. Archiv., 1855, p. 231 (*orbicularis*).

Cyanichthys KAUP, Wieg. Archiv., 1855, p. 231 (*cæruleus*).

Diodon BLEEKER, Atlas Ichth., Gymnod., 1865, p. 55 (*atinga*), the first species named by Linnæus; not *Diodon*, as properly restricted by Kaup to *Diodon hystrix*.

Body broad, depressed, moderately inflatable. Dermal spines short, stout, immovable, triangular, each with 3 roots; nasal tube simple, with two lateral openings; the tube sometimes rounded, sometimes flattened, and with the partition feeble and easily torn so that the tentacle appears undivided; caudal peduncle short; fins small, formed as in *Diodon*; jaws without median suture. Species numerous, of smaller size than those of *Diodon*, the spines broader and lower, their bases forming a coat of mail.

(χεῖλος, lip; μυκτήρ, nose "Narines non closes au sommet, mais chacune ayant l'apparence de deux lèvres, ou formée de deux tentacules réunis à la base.")

a. CHILOMYCTERUS: Nasal tentacle flattened, divided; fins spotted with black; supra-orbital spines 3, feeble; no spine on forehead; supraocular cirrus wanting; upper parts with short, dark streaks or bars, becoming blotches on the sides.

californiensis.

25. CHILOMYCTERUS CALIFORNIENSIS Eigenmann.

TORABUKU (TIGER PUFFER); HISHIBUKU (DIAMOND PUFFER); KAERUBUKU (FROG PUFFER).

Diodon tigrinus SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 228, pl. CXXVIII, fig. 1, Nagasaki, not of Cuvier.

Chilomycterus tigrinus ISHIKAWA, Prel. Cat., 1897, p. 1, Tokyo, Misaki.

*Chilomycterus californiensis*¹ EIGENMANN, Amer. Nat., V, 1891, pp. 25, 1133, San Pedro, California.

Chilomycterus californiensis JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 361, Tokyo.

Chilomycterus californiensis SNODGRASS and HELLER, Proc. Biol. Soc. Wash., 1901, Galapagos Islands.

¹The following is the substance of Dr. Eigenmann's account: No tentacles anywhere. Spines of back all low, those of front especially so, increasing in size toward belly, where they become much larger than those of back. No spine on middle of forehead. A spine at upper anterior angle of orbit; one above, somewhat behind its middle; one slightly behind and above its upper posterior angle; another halfway between the last and the upper angle of pectoral, and another before and a little above the upper margin of pectoral. Blue above, white below; forehead and bases of all the fins with small (one-sixteenth inch) dark spots, fewer on anal; back densely covered with short streaks or bars, which become larger spots on sides; a few round dark spots (one-fourth inch in diameter) on belly; spots below eye larger than those on forehead, similar in size to those on caudal peduncle. Length 9½ inches. San Pedro, California.

Head $2\frac{3}{8}$ in length; depth $3\frac{3}{8}$; depth of caudal peduncle $5\frac{1}{2}$ in head; eye (width of bony orbit) $3\frac{3}{8}$; snout 3; interorbital space $1\frac{1}{8}$; dorsal rays 12; anal rays 11.

Upper contour of snout somewhat concave; interorbital space broad; concave; eyes placed obliquely, the anterior part of margins being nearer together than the posterior parts. Nasal tentacle flattened, bilobed. Gill opening somewhat wider than base of pectoral. No supraocular cirrus. Dental plates with a rough surface, without median suture, bluntly pointed anteriorly, the cutting edges concave.

Spines all short and blunt, increasing in size posteriorly both above and below; a very low, four-rooted spine on posterior part of interorbital space; three low supraocular spines, followed by a row of three somewhat higher spines, the posterior of which is above the pectoral fin; no spines on cheeks; middle of belly with very low spines; two small spines on upper part of caudal peduncle.

Fins rounded; dorsal $2\frac{1}{2}$ in head, anal $2\frac{1}{2}$, caudal $1\frac{1}{2}$, pectoral $2\frac{1}{4}$.

Color brown above, yellowish white below, the color distributed in indistinct clouds on back; five more or less distinct broad vertical bands on sides, the first extending downward from front of orbit and across chin below, the second immediately anterior to gill opening, the third posterior to base of pectoral, the fourth just anterior to insertion of dorsal, the fifth at base of caudal fin; upper lip dark; fins with many round brown spots.

Coasts of Japan, rare; also recorded from San Pedro, California, and the Galapagos; here described from a specimen from Tokyo. This specimen we can not separate from a Galapagos example which we identify as *Chilomycterus californiensis* Eigenmann, obtained at the Galapagos Islands by Snodgrass and Heller. It is close to *Chilomycterus atinga* (Linnaeus) (= *reticulatus*) of the Atlantic. Comparison of specimens shows considerable variation, but no unquestionable differences among the Pacific examples.

Family V. MOLIDÆ.

HEAD-FISHES.

Body oblong or more or less short and deep, compressed, truncate behind, so that there is no caudal peduncle. Skin rough, naked, spinous, or tessellated. Mouth very small, terminal; teeth completely united in each jaw, forming a bony beak without median suture, as in the *Diodontidæ*. Dorsal and anal fins similar to each other, falcate in front, the posterior parts more or less perfectly confluent with the caudal around the tail; no spinous dorsal; no ventral fins; pelvic bone undeveloped; pectorals present. Belly not inflatable; gill openings small, in front of pectorals; an accessory opercular gill; no air bladder. Fishes of the open seas, apparently composed of a huge head to which small fins are attached; found in most warm seas, pelagic in habit,

and reaching a very large size. The very young are variously shortened in form and armed with spines. The flesh in these fishes is coarse and tough, and they are not used as food.

- a. Body suborbicular, not twice as long as deep; skin thick, rough, gristly, without hexagonal plates *Mola*, 7.
 aa. Body oblong, about twice as long as deep; skin smooth, tessellated, with smooth hexagonal plates *Ranzania*, 8.

7. MOLA Cuvier.

- Mola* CUVIER, Tableau Elém. Hist. Nat. Animaux, 1798, p. 323 (*rotunda* = *mola*).
Orthorogoriscus BLOCH, Syst. Ichth., Schneider ed., 1801, p. 510 (*mola*); misprint for *Orthogoriscus*.
Cephalus SHAW, General Zoology, V, 1804, pp. 2, 432 (*mola*).
Orthragus RAFINESQUE, Caratt. Alc. Nuov. Gen. e Nuov. Sp. Anim. e Piante della Sicilia, 1810, p. 17 (*luna* = *mola*).
Diplanctias RAFINESQUE, Caratt. Alc. Nuov. Gen. e Nuov. Sp. Anim. e Piante della Sicilia, 1810, p. 17 (*nusus* = *mola*).
Tympanomium RANZANI, Novi Comm. Ac. Sci. Bonon., V, 1837, p. 3, pl. after p. 81 (*planci* = *mola*).
Trematopsis RANZANI, Novi Comm. Ac. Sci. Bonon., V, 1837, p. 3, pl. after p. 81 (*willughbeii* = *mola*).
Ozodura RANZANI, Novi Comm. Ac. Sci. Bonon., V, 1837, p. 3, pl. after p. 81 (*orsini* = *mola*).
Pedalion (Guilding MS.) SWAINSON, Nat. Hist. and Class'n. Fishes, etc., 1839, I, p. 199; II, pp. 195, 329.
Aledon CASTELNAU, Mém. sur Poissons Afrique Aust., 1861, p. 76 (*storeri* = *mola*).

LARVAL FORMS.

- Molacanthus* SWAINSON, Nat. Hist. and Class'n Fishes, etc., II, 1839, pp. 195, 329 (*pallasi*).
Pallasia NARDO, Ann. Sci. Regno Lombard., Venet., V, 1840, pp. 10, 112, (*pallasi*).
Acanthosoma DE KAY, New York Fauna, Fishes, 1842, p. 330 (*carinatum*).
Centaurus KAUP, Archiv. Naturgesch., I, 1855, p. 221 (*boops*).

Body ovate, strongly compressed, covered with a thick, rough, leathery, elastic skin, which is without bony plates. Profile forming a projecting fleshy nose above the mouth. Dorsal fin beginning not far behind pectorals, short and high, falcate, confluent with the anal around the tail; no large spines on the body. Clumsy fishes, found in most warm seas, reaching a great size; the young (*Molacanthus*) with the body deeper, much compressed, without trace of caudal fin, its place taken by a row of marginal spines.

(*Mola*, a millstone.)

26. MOLA MOLA (Linnæus).

- Tetrodon mola* LINNÆUS, Syst. Nat., 10th ed., 1758, pp. 334, 412, Mediterranean; after *Ostracion theoplatus subrotundus* ARTEDI, Genera, 1738, p. 61.
Orthogoriscus mola BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 510.—SCHLEGEL, Fauna Japonica, Poiss., 1847, p. 288, pl. cxxvii, Nagasaki.—GÜNTHER, Cat. Fish., VIII, 1870, p. 317.
Mola aculeata KÖLREUTER, Nov. Comm. Petropol., X, 1766, p. 337, pl. viii, figs. 2 and 3.

- Mola rotunda* CUVIER, Tableau Elém. Nat. Hist., 1798, p. 323; after *Tetrodon mola* Linnæus.
- Tetrodon lune* LACÉPÈDE, Hist. Nat. Poiss., I, 1798, p. 509.
- Orthorogoriscus hispidus* BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 511.
- Orthorogoriscus fasciatus* BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 511.
- Cephalus brevis* SHAW, Gen. Zool., V, 1804, p. 437, pl. CLXXVI.
- Cephalus pallasianus* SHAW, Gen. Zool., V, 1804, p. 440.
- Diodon carinatus* MITCHILL, Ann. Lye. Nat. Hist. New York, II, 1815, p. 264, pl. v, fig. 1, New York.
- Acanthosoma carinatum* DE KAY, New York Fauna, Fishes, 1842, p. 330, pl. LV, fig. 179.
- Orthorogoriscus spinosus* CUVIER, Règne Animal, 1817.
- Cephalus orthorogoriscus* RISSO, Eur. Mérid., III, 1826, p. 173.
- Ozodura orsini* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, 1839, p. 82, Mediterranean Sea; Nov. Comm. Ac. Sci. Inst. Bonon., III, 1839, pl. VI.
- Tympanomium planci* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, 1839, p. 82, Adriatic Sea.
- Diplanchias nasus* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, p. 82, "in mari siculo."
- Trematopsis willughbei* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, p. 82, in oceano.
- Orthorogoriscus retzii* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, p. 82, no locality.
- Orthorogoriscus ghini* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, p. 82, Mediterranean Sea.
- Orthorogoriscus rondeletii* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, p. 82, Mediterranean Sea.
- Orthorogoriscus blochii* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, p. 82, "in mari oceano."
- Orthorogoriscus alexandrini* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, p. 82, Adriatic Sea.
- Orthorogoriscus redi* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, p. 82, Mediterranean Sea.
- Orthorogoriscus oculatus* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, p. 82.
- Orthorogoriscus lunaris* GRONOW, Cat. Fishes, ed. Gray, 1854, p. 165, Mediterranean Sea.
- Orthorogoriscus solaris* GRONOW, Cat. Fishes, ed. Gray, 1854, p. 165, Mediterranean Sea.
- Orthorogoriscus elegans* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, Atlantic Ocean.
- Orthorogoriscus battaræ* RANZANI, Nov. Comm. Ac. Sci. Inst. Bonon., III, Adriatic Sea.
- Aledon storeri* CASTELNAU, Poiss. Afr. Austr., pp. 75, 76.
- Aledon capensis* CASTELNAU, Poiss. Afr. Austr., pp. 75, 76, Cape of Good Hope.
- Pallasia pallasi* NARDO, Ann. Sci. Regno Lombard., Venet., X, 1840, p. 112, Venice.
- Orthorogoriscus analis* AYRES, Proc. Cal. Ac. Sci., II, 1854, p. 31, fig. LIV, San Francisco.
- Mola nasus* STEENSTRUP and LÜTKEN, Overs. Dansk. Vid. Selsk. Forh., 1863, p. 36.
- Mola retzii* STEENSTRUP and LÜTKEN, Overs. Dansk. Vid. Selsk. Forh., 1863, p. 36.
- Orthorogoriscus ozodura* HARTING, Verhand. Ak. Wet. Amsterd., 1868, pp. 1-48, pls. I-VIII.
- Ostracion boops* RICHARDSON, Voy. Erebus and Terror, Ichth., 1844, p. 52, South Atlantic.

Head 3; depth $1\frac{3}{8}$; D. 17; A. 16. Dorsal and anal fins high in front, rapidly decreasing backward, the height of each about $2\frac{1}{2}$ in length of

body in adult; caudal fin low, with a wavy outline. Depth always more than one-half length, and in the young the vertical diameter exceeding the longitudinal. Form varying much with age, the body becoming more elongate, the fins comparatively shorter, the eye much smaller, and a hump being developed above the mouth, topped by an osseous tubercle. Dark gray; sides grayish brown with silvery reflections; belly dusky; a broad blackish bar running along the bases of the dorsal, caudal, and anal fins.

Pelagic, inhabiting most temperate and tropical seas, swimming slowly about, the high dorsal above the surface. Occasionally northward to Tokyo, England, Cape Cod, San Francisco; rare in the West Indies. It reaches a weight of 300 to 1,800 pounds. Japanese specimens are occasionally taken, but only one, from Nagasaki, has been closely examined by us. This specimen has the dorsal very high, $2\frac{1}{10}$ in body. The above description is from Atlantic examples. The published figures of Japanese specimens indicate no difference.

(*Mola*, a millstone.)

8. RANZANIA Nardo.

Ranzania NARDO, Ann. Sci. Regn. Lombard., Venet., V, 1840, pp. 10, 105, (*truncatus*).

Body oblong, the depth about one-half height; skin smooth, tessellated, divided into small hexagonal scutella; caudal truncate. Otherwise essentially as in *Mola*, the size smaller. The larval forms are unknown. Pelagic.

(Named for Camillo Ranzani, of Bologna, an excellent naturalist, who was led by the variations in the form of *Mola* to an ineffective subdivision of the species in many genera.)

27. RANZANIA MAKUA Jenkins.

Ranzania makua JENKINS, Proc. Cal. Ac. Sci., 2d ser., V, October 31, 1895, pp. 780, 784, with colored plate, Pearl Harbor, near Honolulu.—JORDAN and EVERMANN, Fish. N. M. America, 1898, p. 1755, copied.

D. 17; A. 18; C. 19; P. 3. Depth $2\frac{1}{3}$ in length to base of caudal; head $2\frac{5}{8}$; eye 6 in head, $2\frac{3}{8}$ in snout.

Body much compressed, the ventral margin a sharp, evenly curved keel. Eye much above axis of body, a little nearer snout than base of pectoral. Teeth forming a turtle-like beak completely hidden by projecting folds of skin, which form a truncated opening to the mouth. Gill opening just in front of upper base of pectoral, covered by a 2-lobed valve. Body covered by an armor of small plates, more or less hexagonal and concealed. Pectoral about $1\frac{1}{2}$ in head, above axis of body; height of dorsal about equal to head; anal slightly lower; dorsal and anal each separated from the caudal by a notch. Color bright silvery on sides, upper parts dark; sides with brighter silvery

bands, the first 3 with distinct black borders, the next 4 with numerous black spots, the black margins appearing only on lower parts.

Differing from *Ranzania truncata* chiefly in the smaller eye, in having the eye placed well above the mouth and above the axis of the body, in the high position of the pectoral fin, in the higher dorsal and anal, and in the coloration. Originally known from one specimen in Leland Stanford Junior University Museum, 20 inches long, taken at the mouth of Pearl Harbor, Oahu, by Mr. Hiel Kapu, and sent to Stanford University by Mr. Charles B. Wilson. A second example about 4 inches long was secured by the senior author at Honolulu during the summer of 1901.

It is rarely taken in Japan. In a collection of old paintings belonging to Count Daté, examined by us in Sendai, is a fine colored figure of this species with the legend in Japanese, "Off the Sea of Akabane in Mikawa by Sokichi Minake." The picture was made about 1850. The coloration is rather more spotty than in the type of *Ranzania makua*.

(*Makua*, the native name of the fish, meaning "the source from which the Bonito and the Albacore sprung in ages past.")

RECAPITULATION.

Suborder GYMNODONTES.

Family I. TRIODONTIDÆ.

1. *Triodon* Reinwardt.
1. *bursarius* Reinwardt; Misaki.

Family II. TETRAODONTIDÆ.

2. *Spheroides* Lacépède.
- § *Lagocephalus* Swainson.
2. *sceleratus* (Forster).
3. *spadiceus* (Richardson); Tokyo, Nagasaki.
4. *stictonotus* (Schlegel); Hakodate, Misaki, Nagasaki.
5. *inermis* (Schlegel).
6. *porphyreus* (Schlegel).
7. *rubripes* (Schlegel); Tokyo, Wakanoura.
8. *xanthopteris* (Schlegel).
9. *pardalis* (Schlegel); Hakodate, Aomori, Matsushima, Tokyo, Misaki, Onomichi, Nagasaki.
10. *abbotti* Jordan and Snyder; Tokyo.
11. *exascurus* Jordan and Snyder; Misaki.
12. *ocellatus* (Osbeck).
13. *alboplumbeus* (Richardson); Aomori, Wakanoura, Onomichi, Tsuruga.
14. *vermicularis* (Schlegel); Tokyo, Misaki, Kobe, Tsuruga, Nagasaki.
15. *borealis* Jordan and Snyder; Otaru, Mororan, Hakodate, Aomori, Samé, Matsushima.
16. *niphobles* Jordan and Snyder; Tokyo, Misaki, Wakanoura, Tsuruga, Nagasaki.

§ *Spheroides*.

17. *richei* (Fréminville).

18. *chrysops* (Hilgendorf); Tokyo, Misaki.

3. *Tetraodon* Linnæus.

§ *Tetraodon*.

19. *firmamentum* (Schlegel).

§ *Oroides* Duméril.

20. *aërostaticus* (Jenyns); Misaki.

21. *hispidus* Linnæus; Okinawa, Ishigaki.

22. *meleagris* Lacépède; Okinawa.

Family III. TROPIDICHTHYIDÆ.

4. *Eumycterias* Jenkins.

23. *rimulatus* (Schlegel); Tokyo, Misaki, Wakanoura, Kobe,
Nagasaki.

Family IV. DIODONTIDÆ.

5. *Diodon* Linnæus.

24. *holacanthus* Linnæus; Misaki, Wakanoura.

6. *Chilomycterus* Bibron.

25. *californiensis* Eigenmann; Tokyo.

Family V. MOLIDÆ.

7. *Mola* Cuvier.

26. *mola* (Linnæus); Tokyo.

8. *Ranzania* Nardo.

27. *makua* Jenkins; Akabane.

TWO NEW SPECIES OF ALGÆ OF THE GENUS BUTHOTREPHIS, FROM THE UPPER SILURIAN OF INDIANA.

By DAVID WHITE,
Custodian of Paleozoic Plants.

The specimens which form the subject of this paper were collected by Mr. C. E. Newlin from the Eurypterid beds at Kokomo, Indiana, and were communicated by Dr. E. M. Kindle, assistant State geologist. The Eurypterid beds are correlated with the Rondout of Schuchert and Clarke, and the fossils are therefore nearly contemporaneous with the closely allied species *Buthotrephis lesquereuxii* Grote and Pitt, from the Waterlime of western New York.

The original of Plate XVII, *Buthotrephis newlini*, is in the Paleozoic plant collection of the U. S. National Museum. The type of *B. divaricata*, Plate XVI, is in the private collection of Mr. Newlin in Irvington, Indiana.

The characters of the specimens in hand will first be described before entering upon a discussion of the nature or affinities of the genus *Buthotrephis*.

BUTHOTREPHIS DIVARICATA, new species.

(Plate XVI.)

Fronds very openly fasciculate from a broad attachment; lamina relatively broad, sinuately curved, two or three times dichotomous, beginning near the base, the distance between the bifurcations being about three times the width of the lamina, which is of nearly equal breadth at all points; divisions and lobes divaricate, usually at a wide angle, and outward curved; lobes rounded or round-truncate at the apex, which is slightly denser; carbonaceous residue thin, rugulose or minutely granulose, and marked, especially along the medial portion, by very delicate, irregularly, but more or less obliquely, arranged trichomatose or filamentose (?) impressions.

The aspect and general features of this well-marked species are well shown in the photographic illustration, Plate XVI, which represents the only specimen of this type communicated. The most salient characters are the divaricate position of the subdivisions of the frond at

the frequent and equal dichotomies; the continuity in width of the lamina, which is without a central axis or strand; and the very obtuse, slightly thickened apices. The greater density or more compact organization of the latter is shown by the slight increase of the carbonaceous residue. In many of the lobules the impressions seem to indicate groups of compressed, nearly contiguous, globular bodies, the largest of which, shown in the upper portion of the figure, attain a diameter of about 2 mm. These globules (?), of varying size, appear in some cases to occupy nearly the entire apex of the lobe. The impressions, which are less distinct in passing downward along the center of the lobe, are at best a little vague. It is possible that they are due only to the mode of cleavage in the denser carbonaceous residue; but it seems probable that they owe their presence to differences in the composition of the lamina. They are suggestive of the sporangia in the lobes of the living *Fucus*.

BUTHOTREPHIS NEWLINI, new species.

(Plates XVII, XVIII.)

Fronds fasciculate from a rather thick, scarcely axial base, the divisions forking generally distantly, but equally or nearly so, or sometimes subfasciculately, at a moderate or wide angle, the lobes often linear, sometimes terminally bifurcated, obtusely rounded and denser at the apex; lamina of nearly constant width, though narrowing slightly for a distance below each bifurcation; texture slightly rugose, marked by irregular, very slender, intermingled and tangled trichomatose or filamentose elements, those near the center being coarser, often threadlike, and more or less longitudinal in their arrangement.

This species has much in common with *Buthotrephis lesquerenii* Grote and Pitt, from which it is distinguished by its narrower and much more frequently forking divisions, the divisions of the latter species being much elongated and very distantly forked.

The trichomanose or rather coarsely tomentose character is distinctly visible in the impression of the lower portion of the plant as well as at the apices of the lobes. In the lower portion of the frond it appears to be produced by a tangle of filaments suggestive of the texture of felt cloth, although those nearer the middle of the lamina are coarsest. A similar texture is seen in *Buthotrephis lesquerenii* and, with finer filaments (?), in *B. divaricata*. In the lower part of the main division on the right in Plate XVII some of the coarse fibroid filaments (?) are by the aid of a weak lens clearly seen on the surface of the carbonaceous residue. No trace of fructification is recognizable.

The fragment illustrated in Plate XVIII is here regarded as a more delicate or perhaps younger example of the *B. newlini*, although the more slender proportions of the divisions and the more delicate texture possibly merit a varietal distinction. The surface is of the same

general character as that of the original of Plate XVII. In portions of the impression it presents a slightly irregularly woven or cloth-like mesh strikingly suggestive of the spongy composition of the living *Codium*.

The genus *Buthotrephis* was described in 1847 by Hall¹ as an alga characterized by "Stems subcylindrical or compressed, branched; branches numerous, divaricating, leaf-like; structure vesicular?" The species *Buthotrephis antiqua*,² from the Calcareous sandstone at Chazy, New York, generally cited as the type of the genus, is a distinctly algaoid form with a narrow, flattened lamina, irregularly branching at a wide angle along the imperfectly defined axis, and dichotomous in the upper part, with more or less acute, narrowly lanceolate or sub-falcate lobes or ultimate divisions. *Buthotrephis gracilis*, the form described by Hall³ as typical of the genus, resembles a linear-leaved *Potamogeton*. It presents an axial development, although the divisions fork and are slightly recurved.

In form, aspect, and even in their supposed vesicular structure the Kokomo types appear undoubtedly to belong to the group of narrow forms originally included by Hall, on the basis of their superficial characters, in *Buthotrephis*. It is, however, understood by all paleontologists that the discovery of the reproductive organs in the various species of this artificial genus may necessitate their ultimate reference to more than one family as well as to several genera. Of Hall's species, that most closely resembling the plants in hand is the *B. succulens*⁴ from the Trenton at Glens Falls, New York. The latter agrees in its dichotomizing fronds, lax habit, nearly constant width of the lamina in passing upward, and the blunt apices of the lobules, though differing, especially from *B. divaricata*, by the more distant bifurcations, and the less divaricate position of the branches and lobes, while the latter are terete and less truncate. The enlarged apices of *B. newlini* suggest the *B. impudica* Hall,⁵ from the Clinton, though the same feature is slightly apparent in *B. palmata*, whose general plan recalls that of *B. divaricata*. *Buthotrephis submodosa* Hall,⁶ from the Hudson River group, like the *B. gracilis* has a somewhat elongated or axial form of development,⁷ though the lateral divisions are dichotomous.

Of all the species as yet ascribed to this genus that which seems to be most closely related to the fossils in hand is the *Buthotrephis les-*

¹ Palæontology of New York, I, p. 8.

² Idem., I, p. 8, pl. ii, fig. 6.

³ Idem., I, p. 62, pl. xxi, fig. 1.

⁴ Idem., I, p. 62, pl. xxii, fig. 2.

⁵ Idem., II, p. 20, pl. vi, fig. 2.

⁶ Idem., I, p. 262, pl. lxviii, fig. 3.

⁷ Certain of the elongated forms of the genus might with convenience in classification be set apart as a distinct section.

guereurii described by Grote and Pitt¹ from the Waterline near Buffalo, New York.

The examination of specimens of this species in the collections of the U. S. National Museum shows it essentially to differ from *B. newlini* only by its more robust, linear, and more rarely forked divisions. The texture is of precisely the same character, though the filamentous (?) elements are less distinct.

On account of the relatively large amount of carbonaceous residue and the slightly rugose or vesicular texture, which is in strong contrast to the delicate film, smooth impression, noncarbonaceous cast, or the coralline residue of most fossil algæ, those forms with the characters of the types in hand or of *Buthotrephis lesquereurii* are regarded by many paleontologists as probably representing sponges. Neither of the specimens described above, which have been submitted to a number of experts² in Paleozoic invertebrate paleontology, nor the examples of the species last mentioned, appear to reveal a sponge structure or the normal occurrence of sponge spicules. The evidence in support of a sponge relationship for these organisms appears therefore to lie in their dense, apparently vesicular texture, and their occurrence in distinctly marine beds and in association with a marine fauna.

It is not the purpose of the writer to strenuously urge that these fossils are marine algæ, although he believes them to be such. The evidence, or perhaps to speak more accurately, the circumstances which point toward a place for these types among the marine algæ are: (a) The marine habitat; (b) the typically algaloid form of development and growth, and (c) the aspect of the residue. All of these features may pertain to a fossil sponge; yet the absence of a regular sponge structure, and especially the lack of spicules in these well-preserved specimens, argues somewhat strongly against a reference to a sponge group. Without such characters these fossils can not safely be referred to that class of organisms. On the other hand, the reference of the forms from the Waterline to the algæ can not be conclusively demonstrated, since neither the histology nor the fructification is known. Evidence of this class, though most important, is, however, wanting in most of the fossil types whose thalassophytic nature is generally admitted, although the immediate systematic classification of the latter is usually artificial and largely conjectural.

There are many types of living algæ representing various genera and even families with which the *Buthotrephis* group may with interest be compared. One of these which, in the judgment of the writer,

¹Bull. Buffalo Soc. Nat. Hist., III, 1876, p. 88.

²The thanks of the writer are due to Mr. Charles Schuchert, of the U. S. National Museum, and Mr. E. O. Ulrich and Dr. George H. Girty, of the U. S. Geological Survey, for their courtesy in examining the fossils from Kokomo with a view to the detection of sponge characters.

demands most consideration is the genus *Codium* Stackhouse, to which reference has already been made in the description of *Buthotrephis newlini*. In *Codium* we find sponge-like fronds which may be simple or branched, and which are composed of a mass or plexus of innumerable slender, inextricably tangled or interwoven and irregularly branched unicellular filaments whose ramules form the surface of the frond. Near the center of this mass of curled and branched filaments which gives form to the frond, the individual filaments are often threadlike and sometimes largely longitudinal. The more or less club-shaped ramuli radiate outward and are contiguous, though not united, so as to constitute the periphery of the frond. The fructification of *Codium* is contained in oval or ovate sporangia laterally situated near the bases of the ramules. It is hardly to be expected that such sporangia, enshrouded by ramules, would be discernible in carbonized and compressed specimens except by a most favorable accident of preservation. The analogy between the impression of or the residual surface of the spongoid *Buthotrephis* and the texture of *Codium* is forcibly suggestive; and although the stronger, apparently central, filaments (?) of *B. newlini* (Plate XVII, a) are coarser than any to be seen in such specimens of the dried *Codium tomentosum* as the writer has had for examination, the comparison of the specimens can hardly fail to raise the question as to whether the general structure and nature of the organisms are not essentially the same. In some species of *Codium* the filaments are often somewhat regularly meshed, so that the surface suggests a loosely though irregularly woven cloth-like structure. It is worthy of mention that in *Udotea* Lamouroux, which stands next to *Codium* in the *Codiaceæ*, the frond bears a calcareous incrustation, while in *Halimeda* Lamouroux, another genus of the same family, we find a false epidermis, though the filamentose internal composition of the plant is like that of the other genera of the family.

It is not the object of this discussion to argue that the *Buthotrephis* types under consideration are to be conclusively regarded as belonging to or, at least, as closely allied to the *Codium* group of the Siphonous *Chlorophyceæ* (green algæ), or even that they are indisputably proven to be algæ; it is to call attention to the fact that we have among the algæ, notably in the *Codiaceæ*, types which would seem calculated, under favorable circumstances of fossilization, to present characters of form, aspect, and carbonaceous texture similar to and perhaps essentially the same as those of *Buthotrephis*. The specimens in hand appear, so far as their characters are revealed, to conform to and to be admissible to the algæ, there being no inherent evidence to the contrary.¹ A reference of these forms to the sponges would there-

¹It is possible that a slight calcareous envelope, comparable to that of *Udotea*, might assist in preserving both the form and the substance in the algæ of this group.

fore appear, in the absence of distinctive sponge characters, to be unwarranted at present.

It may not be improper in this connection to add that certain of the organisms generally though doubtfully ranged with the Graptolites might be more at home among the algæ.¹

Among other living algæ whose form is comparable to that of *Buthotrephis*, though agreeing less closely in texture, the genus *Lia-gora* (*L. corymbosa* J. Agardh) may be mentioned, while among the fossil types fronds resembling in a general way those under consideration are found among the abundant Eocene species of *Chondrites*, some of the remains of which are rather densely carbonaceous.²

EXPLANATION OF PLATES XVI-XVIII.

BUTHOTREPHIS FROM THE EURYPTERID (RONDOUT) BEDS AT KOKOMO, INDIANA.

PLATE XVI.

Buthotrephis divaricata David White. Natural size. Collection of C. E. Newlin, Irvington, Indiana.

PLATE XVII.

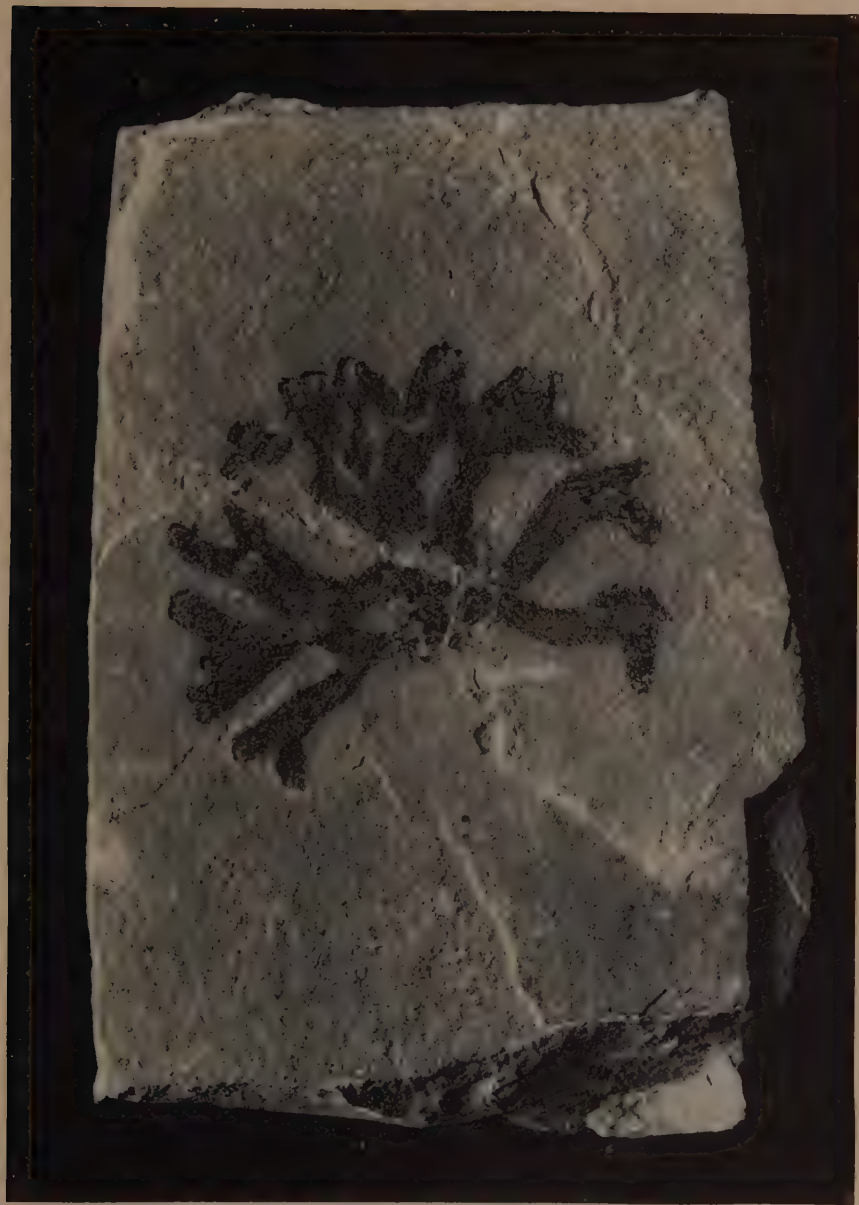
Buthotrephis newlini David White. Natural size. *a.* Enlarged detail showing filamentose texture (x4). Collection of the U. S. National Museum. Cat. No. 8175, U.S.N.M.

PLATE XVIII.

Buthotrephis newlini David White. Form with narrow thalli. Natural size. Collection of C. E. Newlin, Irvington, Indiana.

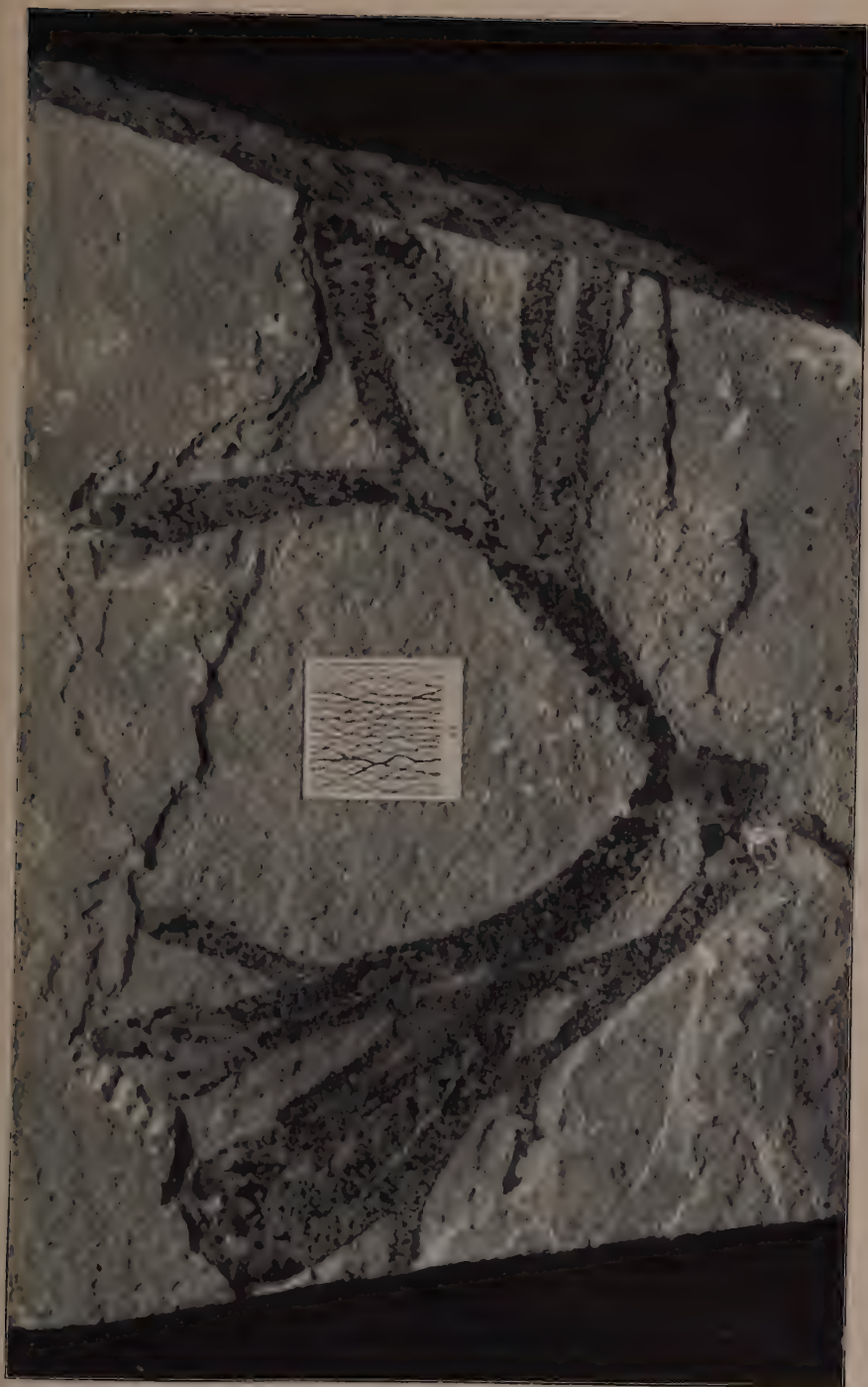
¹The texture of the forms from Kokomo and the Buffalo Waterlime appears to have much in common with some of the specimens now resting in or near *Inocaulis*.

²See *Chondrites dolichophyllus* Squinabol, Contrib. Fl. foss. Terz. Liguria, pt. i, Alghe, pl. B.



BUTHOTREPHIS DIVARICATA DAVID WHITE.

FOR EXPLANATION OF PLATE SEE PAGE 270.



BUTHOTREPHIS NEWLINI DAVID WHITE.
FOR EXPLANATION OF PLATE SEE PAGE 270.



BUTHOTREPHIS NEWLINI DAVID WHITE.
FOR EXPLANATION OF PLATE SEE PAGE 270.

THE FOSSIL FRESH-WATER SHELLS OF THE COLORADO DESERT, THEIR DISTRIBUTION, ENVIRONMENT, AND VARIATION.

By ROBERT E. C. STEARNS, Ph. D.,

Honorary Associate in Zoology.

On turning to any authentic map it will be seen that the great range of the Sierra Nevada, as it approaches the south, makes a rather abrupt divergence in a westerly direction, between latitudes $35^{\circ} 30'$ and $36^{\circ} 30'$. Here also it throws out a great spur which, after extending for a considerable distance toward the east in a nearly easterly and westerly course, then deflects in its main mass toward the south-east, with broad flanks, finally breaking down into hills of greater or less elevation. These lower and somewhat detached portions reach the westerly margin of the Colorado River in the vicinity of Fort Yuma. This, the main spur, is known as the San Bernardino range, and the northerly (east and west section) is called the San Gabriel range, though topographically a part of the other. The rocky ramparts of the San Gabriel Mountains separate the depressed levels on the south from the more elevated plains of the Mojave desert. On the west, facing the westerly slopes of the San Bernardino range, are the San Jacinto Mountains, a part of the Peninsular range, which extends southerly into the Mexican territory of Lower California.

These mountain walls inclose a vast area of arid, desolate waste, the Colorado desert of California. Surrounded by mountains except in the south, and there opening out upon the head of the Gulf of California, it is seen that the desert was a portion of the old gulf which at some former time extended 200 miles above its present limits. The cause of the separation of the upper end of the former gulf, making what is now the Colorado desert, is so apparent that a moment's examination reveals it. The same agency is still operating, widening the space between the present gulf and the desert. Here, nearly 150 miles from the head of the ancient gulf, came in from the east side the Colorado River, bearing in its thick floods quicksands and the red mud from the great plateaus of northern Arizona. The contour of the country shows the gulf to have been narrow here. The filling in went on unceasingly as at the mouth of every great river which enters

the sea at a sheltered point. The water became constantly shoaler, until at length the separation was complete. The deposited material has steadily increased the distance between the gulf and the low bed of the desert, until now the division is marked by a narrow neck of 30 or 40 miles of land but little raised above the level of the sea.

To quote Professor Blake: If the alluvial deposits brought down by the Colorado River were removed, the gulf would flow inward and again occupy its ancient bed. When the stupendous work done by the Colorado River in cutting deep canyons along its course is considered, it is easy to realize the vast quantity of detritus brought down and deposited by that industrious and mighty stream.

The Colorado desert of California is only a portion of a much greater desert area, which extends on the easterly side of the river into western and southwestern Arizona, including the desert of the Gila, reaching for a long distance to the base of a mountain range in the Mexican State of Sonora, the Sierra del Nazareno (?), or spurs of that range outlying to the north, and on the westerly, south of the California boundary, an area of great extent reaches still farther to the south into Lower California, bordering on the gulf.

Here, also, we find a small depressed basin, known as Lake Maquata, its northern end about 10 miles south of the United States boundary, between the Peninsular and Cocopah ranges of mountains. Its surface is doubtless below sea level, but the sediment deposited by the Colorado has created a permanent barrier between it and the Gulf of California. Millions of fresh-water snail and "clam" shells are strewn over the bed or along the former shores of the lake, sufficient evidence that it had once been filled with fresh water.¹ In Sonora it embraces a large and indefinite area, of which but little is known. The northerly portion of the desert, that is to say, the California section, contains approximately 6,000,000 acres, included in the boundaries of San Diego and Riverside counties. To the east and northeast of the San Bernardino range, in these counties, lying between the range and the Colorado River, extending to the higher desert levels to the north, there is a region of numerous dry lakes and springs, the latter usually dry or intermittent, according to the seasonal rainfall. Of the desert region exterior to the California portion but little is known, and the Californian area, so far as the Mollusca are concerned, has been only partially explored. The species we are considering have been found in many places quite remote from the Colorado desert.

At the north, ranging as far as Death Valley in Inyo County, thence northeasterly to the shores of Sevier Lake in Utah. Turning southward, the occurrence of the *Paludestrina* in the States of Durango and Michoacan, Mexico, the latter region 1,800 miles south of the Colorado desert, may well be regarded as most extraordinary, as well as the

¹C. R. Orcutt, in *West American Scientist*, 1891.

circumstances under which the examples from this remote locality were discovered.

The southerly portion of the Great Basin, including the immense area from the easterly flanks of the Sierra Nevada across the State of Nevada to the westerly flanks of the Rocky Mountain ranges in Utah, is characterized by innumerable mountain ranges of varied extent, more or less detached or broken; with intervening valleys of a general desert aspect; with dry lakes and numerous springs of hot or cold, sweet or bitter waters, some perennial, others dry or intermittent, according to the precipitation of the seasons, which vary exceedingly when one year is compared with another; with an occasional season of excessive rainfall, like those of 1840, 1852, 1859, 1861-62, and subsequently, when every water course and depression was filled to overflowing, and springs that had been dormant for years, their sources replenished, became active and continued to flow for months afterwards.

In considering more particularly the Colorado desert region, we find that in these seasons of exceeding precipitation the more depressed portion becomes a lake 60 miles long and 30 wide, as in the winter months of 1861-62, through the inflow by the way of New River,¹ a branch of the Colorado which enters the desert from the south, forming the so-called Salton Sea of more recent years. Aside from these unusually rainy seasons, which are of infrequent occurrence, thunderstorms² of exceeding violence, with a downpour that may be called torrential, often occur during the hottest weather; these are usually of brief duration and their waters fall upon a comparatively limited area. They contribute, however, to the maintenance of animal life and help to perpetuate such forms as we are here considering. Atmospheric agitation at such times, as well as during the hotter weather in ordinary seasons, plays its part. Living and dormant individuals in and around the springs and pools, as well as the dead shells in their immediate neighborhood, are picked up by the wind and carried hither and thither, the greater part buried under the drifting sands, the spiral storms or sand spouts assisting in the general displacement.

¹ What is known as "New River" had no existence before the year 1840, when it broke away from the Colorado and for a time partly submerged the desert. For several years after a chain of lagoons remained. The same thing has probably occurred many times in the history of the desert. H. G. Hanks in Second Report of State Mineralogist of California, 1880-1882, appendix, p. 238.

² Cloud-bursts and waterspouts, accompanied by fearful thunder and lightning, are of frequent occurrence. The ground near Frinks Spring and Flowing Wells stations, a distance of 17 miles, is cut and gullied in a most remarkable manner. In this distance there are no less than 75 bridges and culverts on the railroad track. The gullies vary from 5 to 25 feet in depth and about the same in width. The banks are so steep and precipitous that, in walking along, one does not see the canyon until it yawns at one's feet. These gullies are all caused by the rush of water from cloud-bursts and waterspouts. Joseph F. James in Popular Science Monthly, January, 1882.

While the winds and waters have no doubt played an important part in the dispersion of these and related molluscan forms, we are not restricted to these agencies to explain their widespread distribution. At the present day we find numerous species of aquatic birds frequenting the springs, pools, and marshes or wet meadows wherever such places occur within the larger or general desert area, both north and south. When the present deserts were lakes or lagoons, whose waters covered several hundreds of square miles, and the numerous springs, now dry or intermittent, filled their basins to overflowing, the number of swimming, diving, and wading birds throughout the region must have been very great. In their seasonal migrations or ordinary flights from lake to spring or spring to lake they would unavoidably have carried from one place to another such individual mollusks as adhered to their legs or feathers, and the sticky egg masses of these pond snails also; it is not unreasonable to assume that these were frequently transported in this way over considerable or even great distances.

It should be borne in mind that these tiny mollusks live in the midst of the conferva, and that the best way to obtain specimens is to collect a large quantity of this green scum-like material and spread it on paper in the sun, when it quickly dries up and the shells are easily shaken out. The carrying of these little forms from place to place is facilitated by the character of this vegetable growth which they frequent, as a comparatively small quantity, a little bunch of it, entangled in the feet or on the legs or among the feathers of a duck might contain many individuals.

That these minute forms (*Paludestrina*) are still living in many other localities in the Great Desert than the few which we now know of seems altogether probable when we consider their inconspicuous size and that their shells are usually coated over with the confervoid growth that is generally present in and around springs. Being immersed in this green vegetable scum, they escape detection and are not likely to be seen by persons not familiar with their habits or not especially interested in searching for them. Wherever they do occur they compensate by vast numbers for lack of size, for these little fellows are wonderfully prolific.¹

The evidence of lake or lagoon conditions resulting from the overflow of the Colorado River in the past, is corroborated by the perpen-

¹ Some idea of the immense number of these shells on the surface of the desert may be derived from the following: "We soon noticed that the soil was, to a large extent, made up of minute turreted shells, so small that they could hardly be distinguished from the grains of sand. At certain points they were blown by the wind into windrows, and lay in vast numbers, concentrated from the sands by a natural winnowing process. These are the * * * fossils described in the Smith. Misc. Colls., No. 144, part 3, folio 70. * * * On my return to San Francisco I made experiments showing that it required 166,000 of these minute shells to weigh a pound." H. G. Hanks in Second Report of State Mineralogist of California, 1880-1882, appendix, pp. 227-228.

dicular section exhibited in the well at Walter's station on the Southern Pacific Railroad, as noticed by me in 1879¹. This well was sunk to the depth of 45 or 47 feet when water was struck. The section showed a fine clayey sediment such as is precipitated from turbid waters in a sluggish or placid condition; this sedimentary deposit contained throughout examples of *Paludestrina* and *Physas*, or fragments of both.

At many places in the desert occur what are known as "dry bogs." These are the dried up pools of former years; they are a most dangerous menace to the unwary traveler; the vegetation which the waters of these former basins supported, when dried, is sufficiently strong to support the coating of drifted sand by which they are disguised; the weight of man or beast is sufficient to break through this thin crust and submersion is inevitable. Some idea of the number, extent, and character as well as of the appearance of the desert at the time when these bogs were pools or lagoons, may be seen at a glance in the locality known as Flowing Springs, 40 miles west of Yuma, where many of these so-called springs have the area of ponds or lakelets of considerable size and support a luxuriant aquatic vegetation. Here also may be seen thousands of birds of various species, swimmers, waders, etc., as well as land birds, and the part feathered tribes have performed in the distribution of these little conferva inhabiting mollusks is forcibly suggested.

THE PALUDESTRINÆ.

The forms under consideration were collected by the writer in 1882, in the immediate neighborhood of various stations along the line of the Southern Pacific Railroad in the Colorado desert of California.

Favorable circumstances afforded considerable time at each of the places stopped at, so that a large number, many thousands, of the few species that are so abundant on the surface of the desert were obtained. The shells specially reviewed belonging to the genera *Paludestrina* and *Physa*, inhabit springs, pools, and the shallow, marshy borders of ponds and lakes; they appear to prefer quiet waters rather than flowing brooks or larger streams. Though classed as fresh-water species, they are not infrequently found in waters that are alkaline or saline, also in springs of a temperature as high as 100° F. The particular species of *Paludestrina* mentioned has heretofore been variously referred to the genera *Amnicola*, *Melania*, *Hydrobia*, and later to Stimpson's genus *Tryonia*; ² still later to *Bythinella*. It has been

¹ Remarks on fossil shells from the Colorado Desert, in the American Naturalist, March, 1879 (read before the California Academy of Sciences).

² For Stimpson's figure of the type of *Tryonia*, see fig. 29, and pp. 48 and 49 of Researches upon the *Hydrobiinæ*, etc., Smithsonian Miscellaneous Collection No. 201, August, 1865. Binney's figure in Land and Fresh Water Shells of North America, p. 71, Part III, Smithsonian Miscellaneous Collections, September, 1865, does not represent it.

widely distributed in the course of exchanges between conchologists as *Tryonia*; the latter genus is based on external or shell characters only, and upon these characters is readily separable from any of the numerous varieties of the much commoner form illustrated herein.

From Flowing Springs, many miles from the railway and the station known by said name, I have received probably over a thousand examples of *Paludestrina* since the major portion of this paper was written¹.

The species assigned to the first of these genera which exhibits the numerous varietal aspects figured below, as well as certain other forms hereinafter mentioned, was first detected by Prof. William P. Blake² and Dr. Thomas H. Webb. It was described by Dr. A. A. Gould in March, 1855, as *Amnicola protea*, and by T. A. Conrad as *Melania exigua*, in February, 1855. Gould's description was published first, therefore his name has precedence. Binney placed it in Stimpson's genus *Tryonia*, which error has been continued by subsequent authors, including the writer, who removed it in 1893 to *Bythinella*.

As the numbers of the Smithsonian publications containing Binney's Land and Fresh-water Shells of North America are out of print, and the original descriptions are accessible only to a small number of students, I have quoted Gould and Conrad as below from Binney.³

AMNICOLA PROTEA Gould.

Shell elongate, slender, variable; whirls seven to eight, rounded, divided by a deep suture, simple or variously ornamented, and barred with revolving ridges and longitudinal folds; aperture ovate; lip continuous, simple, scarcely touching the penultimate whirl. Length of the largest specimen, three-tenths, breadth, one-tenth inch.



FIG. 1.—AMNICOLA PROTEA.

From the Colorado Desert (Gran Jornada), Dr. T. H. Webb, W. P. Blake.

Peculiar from its large size and slender form, though differing greatly in its relative proportions. It differs from all others in being variously sculptured with revolving ridges and longitudinal folds, like most *Melania*. It varies greatly also in the relative proportions of length and breadth. It is as slender as *Amnicola attenuate* Hald., and much larger. This appears to be the same shell as that subsequently described by Mr. Conrad, under the name of *Melania exigua*. (Gould.)

MELANIA EXIGUA Conrad.

Turreted; volutions eight, disposed to be angulated and somewhat scalariform above, cancellated, longitudinal lines wanting on the lower half of the body whirl;

¹The great canal system of the Imperial Company by which the waters of the Colorado River are in part diverted so as to irrigate hundreds of square miles of the desert is rapidly approaching completion. The water is already flowing in a considerable portion of the system and soon a part of the sandy waste will give place to green and fertile fields, forming an oasis in the midst of the arid desert.

²Pacific Railroad Reports, V, 1857, p. 332.

³Part III, p. 70 (*Tryonia*).

columella reflected; aperture elliptical. Length, one-fifth of an inch. Colorado Desert, California (Dr. LeConte).

The specimens are numerous and of a chalky whiteness, showing that they are all dead shells. Said to have been found 120 miles distant from any stream passed on the route.

Following Dr. Pilsbry, whose familiarity with these puzzling little shells entitles his conclusions to acceptance, the present status and synonymy should be arranged as below.

Genus PALUDESTRINA Orbigny.

PALUDESTRINA PROTEA Gould (Pilsbry).¹

Plates XIX-XXI. .

= *Bythinella protea* GOULD (Stearns, 1893)².

= *Amnicola protea* GOULD 1855.³

= *Melania exigua* CONRAD, 1855.⁴

= *Tryonia protea* GOULD (Binney et auct., 1865).⁵

+ *Bythinella seemani* FRAUENFELD (Pilsbry, 1893)².

= *Hydrobia seemani* FRAUENFELD, 1863.⁶

This species from 1854, the year of its discovery, was regarded as extinct until June, 1888, when Mr. C. R. Orcutt, of San Diego, collected numerous living examples in Indian or Fish Springs, some 15 miles northwest of the station known as Salton, on the Southern Pacific Railroad. These pools and springs, of which there are several, varying from 10 to 20 feet across, are at the base of the San Jacinto Mountains. "They are only a few feet deep and are surrounded with an almost impenetrable mass of tules, canegrass, and mock willows; the mesquit, screw bean, and various shrubs, rushes, and sedges form the bulk of the wild vegetation." The water is warm, in Mr. Orcutt's judgment not under 100° F., and tastes like the water of the Dos Palms Springs, 6 miles north of Salton, on the opposite side of the desert, at the base of the Chuckawalla or Lizard mountains. An analysis of the water from the latter springs showed slight traces of alum, soda, sulphur, and considerable salt, but not so much as to make it unfit for use.

These springs are all below the present sea level about 100 feet,

¹ "Includes *Bythinella* Moq. Tand. and authors generally," Pilsbry in Catalogue of Amnicolidæ of the Western United States, Nautilus, March, 1899, pp. 121-127.

² Report on the Land and Fresh-Water Shells collected in California and Nevada by the Death Valley Expedition, North American Fauna No. 7, Part II, U. S. Department of Agriculture, May, 1893, p. 278.

³ Boston Soc. Nat. Hist., V, p. 129, March, 1855; Otia, 217.

⁴ Proc. Acad. Nat. Sci. Phila., VII, p. 269, February, 1855.

⁵ Land and Fresh-Water Shells of North America, Part III, Smithsonian Miscellaneous Collections, No. 144, September, 1865, p. 72.

⁶ Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien, Jahrgang, 1863, p. 1025.

judging from the fact that Salton, lying in the depression between Dos Palmas and Indian Springs, is reported to be 250 feet below the sea level from actual measurements. These springs and pools, like those before named, are surrounded by a luxuriant growth of cane grass, tules, etc., and the mesquit, screw bean, and other trees of the same order occur in great numbers. Specimens from this place, presented by Mr. Orcutt, are contained in the National Museum (No. 104886).

Orcutt's discovery was followed, in 1891, by the detection of living examples far to the north in Saratoga Springs, Inyo County, where Mr. E. W. Nelson collected several hundred, and a large number were collected in a marsh near the springs by Mr. Vernon Bailey. These, also, are warm springs, situated in the extreme southeast end of Death Valley, near the bend of the Armagosa River, so called (usually nothing more than a dry wash), at an altitude of 352 feet. The valley is the deepest depression in North America, being 480 feet below the level of the sea. The geographical range, as shown by dead or semi-fossil examples, is far greater and most extraordinary, extending from the shores of Sevier Lake, in middle Utah, as seen by Dr. H. C. Yarrow's collection in 1872¹ (U. S. N. M., No. 73960), to Andocutira, in the State of Michoacan, Mexico. From the latter locality examples were sent to the National Museum (No. 73908) by Prof. A. Dugès some years ago, with the following interesting note:

"Ces mollusques ont été trouvés dans une fourmiere à Andocutira, Etat de Michoacan. La personne qui me les a remis pense qu'ils proviennent d'une ancienne formation lacustre, aujourd'hui couvert par des terrains postérieurs."²

¹ Explorations and surveys of Lieut. G. M. Wheeler, U. S. A., V, p. 498; also G. W. Tryon, in Proc. Acad. Nat. Science, Phila., May 1, 1873, or to Dr. H. C. Yarrow's collection.

Mr. Call, in his interesting paper on the recent and fossil shells of the Great Basin, has not credited this form to either of the ancient lake areas. Attention is directed to Bulletin No. 11 of the U. S. Geological Survey (1884), which contains Call's paper and the following from Prof. G. K. Gilbert's introductory sketch of "The Quaternary lakes," etc.:

"In the northern portion of the Great Basin there were two large water bodies; the one, Lake Bonneville, covering the Great Salt Lake and Sevier deserts, in western Utah; the other, Lake Lahontan, occupying a group of communicating valleys in western Nevada."

The elevation of Pyramid Lake is given by Gannett as 4,890 feet, and Sevier Lake, by the same authority, is 4,600 feet above sea level.

² With these shells from Professor Dugès there was a single example (U. S. N. M. No. 73907) of the very rare and little known *Valvata humeralis*, collected by Thomas Say in Mexico, and described by him nearly three-quarters of a century ago in the New Harmony Disseminator of Useful Knowledge, II, No. 16, August 12, 1829. See Binney's Bibliography of North American Conchology, 1863, part 1, p. 204.

The foregoing is the third instance that has come under my observation of important though indirect assistance rendered by the lower animals in furnishing biological and geological data.

Here we find the southerly range extending 1,800 miles from the Colorado desert, as before mentioned, and the occurrence of this form is corroborated and its presumable wide dispersion in that country shown by Frauenfeld's examples from Durango. The Michoacan and Durango shells, like the Death Valley specimens, belong to the smooth variety which occurs with the other varietal facies in the Colorado region of California.

This smooth form has recently been detected by Dr. Pilsbry¹ in some fluviatile débris from South Spring Creek, near Roswell, New Mexico.

Orcutt's Fish Spring examples are finely granulose. I am further indebted to Mr. Orcutt for several specimens, recently received, that were detected by him living in the Dos Palmas Springs. The Dos Palmas shells vary from individuals with a smooth surface to those that are sculptured by fine revolving threads.

The Sevier Lake (middle Utah) specimens collected by Dr. Yarrow in 1872 are so much weathered as to efface the sculpture. It should be borne in mind, however, that the Yarrow specimens are so few in number that it would be quite unsafe to assume that many other varietal aspects do not occur at the Bonneville localities.²

The collection made by me in 1882, now in the U. S. National Museum, included some 40,000 examples of *Paludestrina* from the surface of the desert at the localities known as Indio, Walters, Dos Palmas, and Volcano Springs. These stations are all within the great depression, being, respectively, 20, 195, 253, and 225 feet below sea level. At these places several hundred specimens of the pond snails *Physa* were collected, as well as a few examples of *Paludestrina longinqua* (= *Ammicola longinqua* Gould), for which no special search was made. A dwarfed aspect of *Fluminicola (columbiana)* occurs occasionally, and two or more species of *Planorbis* are met with, but the absence of any form of the genus *Limnæa* is noteworthy.

In considering the principal varietal features of *P. protea*, we may conveniently group them as follows:

VARIATION IN FORM.

First. It is seen that some individuals are much more attenuated than others. In certain instances the shells are quite robust as compared with length, the basal whorl being conspicuously larger and forming nearly two-thirds of the total length as compared with five-ninths or much less than one-half in other specimens. In diameter the extremes are as 13 to 20.

¹ Nautilus, XIII, November, 1899, p. 79.

² *P. protea* was not detected by Call in the Lahontan region, its place being apparently taken by *Pyrgulopsis nevadensis*, which, though not found in the Lahontan beds, occurs in countless thousands living in Pyramid Lake as well as in Walkers Lake (dead only?).

Second. The convexity or angulation of the whorls is another marked feature. This, it will be seen, is exhibited in various degrees, by comparing figs. 1-4 with 7, 9, 12, and others, until the extreme of angulation and tabulation is reached, as in examples 8 and 11, where, as in the latter, the flattening of the upper part of the whorls is remarkably uniform and produces a turreted effect. Both 8 and 11 are exceedingly rare varieties, only one of each in the many thousands of specimens critically examined.

Third. The aperture or mouth, it will be noticed, is quite variable, both in shape and size, often small, as in fig. 14; the edges simple or thin, generally continuous; again more or less thickened or flattened and flaring, as in figs. 6, 12, and 14; sometimes closely appressed to the basal whorl, frequently barely touching, and often free or not touching it. These latter aspects suggest an umbilicus, as in fig. 13, but the gap is only superficial. In fig. 10 it will be seen the lip is not continuous. The aperture may be round, or very nearly so, rounded ovate, ovate or angulated ovate, as in fig. 11. The length of the aperture and its position as related to the axis of the shell varies in different examples. Compare 9, 11, and 12 with 1, 3, 5, and 10. In 11 there is a sinuous curving callous or fold in the umbilical region just above the mouth.

Gould remarks in his description of *protea*: "It varies greatly * * * in the relative proportions of length and breadth." He also noticed the strength of the sutural definition; and Conrad mentions the general scalariform aspect which is so strikingly exhibited in many of the examples, whether plain or sculptured.

VARIATION IN SCULPTURE.

First. Plain smooth shells like figs. 1 and 2 (with convex whorls), from Death Valley, at Saratoga Springs (Nelson and Bailey); in the Mexican States of Michoacan (Dugès), and Durango (Frauenfeld); near Roswell, New Mexico (Tinsley-Pilsbry). The eroded Sevier Lake, Utah, specimens (Yarrow) may be included with the above. Then follow the smooth-surfaced forms, with whorls somewhat angulated on the upper part, as shown in fig. 6, and the unique, strongly angulated example, fig. 8. In this the pronounced angulation of the whorls points toward my species, *Pyrgulopsis nevadensis* of Pyramid Lake.

Second. Spirally lirate or threaded (whorls convex), the liræ more or less prominent, as in figs. 3 and 4. All of Orcutt's Dos Palmas Springs, ten living specimens are of this pattern. In fig. 9 is shown an unusually robust example (whorls slightly angulated above), the liræ distinct, but much less conspicuous than in the slenderer, more strongly angulated and threaded fig. 10. In fig. 11 the angulation of the part of the whorls is extremely developed, passing into tabulation or flattening, producing a turreted effect, and the spiral threading numerous, closely set, and well defined.

Third. A connecting link between the above and the cancellated forms—that is to say, forms that are sculptured both transversely and longitudinally—as seen in fig. 12. Robust, angulated, spirally liræ, and longitudinally plicate on the third and fourth whorls from the tip of the apex; the eccentric character of the aperture makes this a unique example. In fig. 5 is presented a slenderer form with the chief sculpture characters of fig. 12. In this the threading of the penultimate whorl is inconspicuous, increasing in prominence on the three whorls above, which are also strongly ribbed longitudinally; the whorls are rounded above.

Fourth. Longitudinal sculpture strongest. In all of the following examples the spiral sculpture is seen and is more or less conspicuous. This character varies, however, in figs. 6 and 14; the liræ are numerous and closely, evenly placed; in these also the shells are slenderer, and the longitudinal ribs cross the spiral threading without interruption. In fig. 6 it will be noticed the whorls are convex, in fig. 14 somewhat angulated above, and the mouth in the latter is small. No. 5, in the third group, might be included here, perhaps, as appropriately as where I have placed it.

Fifth. Cancellated and nodose sculptures are the prominent features in the forms here included. The whorls in all are angulated above; the spiral threadings vary in number, and where crossed by the lengthwise ribs become tuberculated or nodose. In fig. 13 is seen a repetition of the slenderer aspect, and in fig. 18 is shown the maximum of robustness. On the basal whorl, close-set fine threading below, above a double threading is a conspicuous feature, with wider interspaces, which extends to the upper whorls.

In figs. 15 and 16 are examples intermediate in size and other characters. A ventricose example is presented in fig. 17, distinctly but not strongly threaded with many of the features of No. 18; in this the longitudinal sculpture is only suggested.

These filose, cancellated, and tuberculated varieties call to mind familiar forms belonging to the American *Strepomatidae*, which, no doubt, were in Conrad's mind when he described certain aspects of the shells herein reviewed as *Melania exigua*.

Orcutt's recent examples, collected by him at the Fish Springs locality, contained in the U. S. National Museum (No. 104886), are not figured; in these the surface is finely granulose. As only a small number of shells from the Orcutt localities have been examined, it is not known whether the springs visited by Mr. Orcutt contain other varieties than those described.

It will be observed that the forms from the remote localities, namely, Death Valley and Sevier Lake in the north, Durango and Michoacan in the south, and New Mexico in the east, are sculptureless; that is to say, are of the smooth surfaced form described by Frauenfeld.* These Roswell, New Mexico, examples determined by Dr. Pilsbry extend the

distribution so much farther in that direction than before known as to warrant the expectation of the finding of *P. protea* in some of its many varieties at intermediate localities.

The eighteen examples figured as representatives of the many facies of this exceedingly variable form are connected in one character or another by innumerable individuals which blend or intergrade, and which it would be impracticable to describe. The above are numbered in the U. S. National Museum Register 47854, with second or index numbers 1 to 18, in as many tubes corresponding to the number of each figure as given in this paper.

With the exception of the New Mexico and Durango localities, all of the others are represented in the U. S. National Museum collection.

The occurrence in the Colorado desert of California, of the well-marked form described by the late Dr. Stimpson as *Tryonia clothrata* has not been verified by any of the collections made by various parties, as well as myself; not a single example having been detected in the thousands of specimens examined. The only locality where it is definitely known to occur is in the Pahrnagat Valley, Nevada, where Dr. C. Hart Merriam collected a number of living specimens in a hot spring. The dead bleached shells collected forty years ago by Prof. W. P. Blake, and later by General Carlton in 1861-62, were probably found somewhere in the region of the Merriam locality, which is at a high altitude, 3,000 feet or more, in southern Nevada. There is a vast area between the Pahrnagat and California localities practically unexplored; of its molluscan life scarcely anything is known.

As to the causes of the extreme variation exhibited by the shells of this species, I will repeat what I have heretofore written by quoting from the "Report on the Land and Fresh-Water Shells collected in California and Nevada by the Death Valley expedition,"¹ as follows:

The suggestion that arises from the study of the forms above reviewed and the regions and conditions to which they are related point to the causes that induce variation and to the permanency of species and genera, or to the mutability of the same, as dependent on environmental characteristics.

If we are warranted in assuming * * * that with a volume of water ample or maximum and chemical proportions as related to volume minimum our *Tryonias* would be smooth, and that the smooth or sculptureless surface that so generally prevails in the *Bythinellas* and related groups is, in a conventional sense, normal, then we may reasonably assume that to the opposite of these conditions, with volume of water variable or minimum and chemical proportions as related to volume of water increased or maximum, the phenomena of variation may be attributed. That fluctuations in volume of water in the springs, pools, lagoons, etc., throughout the entire desert region above described are occasional, if not of frequent occurrence, is well known, and in some years the maximum is extreme, as has been pointed out.

¹ North American Fauna, p. 280, U. S. Department of Agriculture, 1893.

In reviewing the forms herein considered it will hardly be questioned that the variation they exhibit is correlated with salinity, using the word as synonymous with alkalinity, or the mineral character of the waters in which the shells are found. In connection with the foregoing the suggestion arises that some of the many springs now obsolete contained what in common parlance may be called a distinct species, or shells that were characterized by a single facies of sculpture, etc. Thus, in Mr. Orcutt's Indian or Fish Springs specimens the surface is finely granulose. His Dos Palmos shells are spirally threaded, though these aspects of sculpture are not always—that is to say, in all the specimens—equally conspicuous. The Saratoga Springs examples of the Death Valley expedition are, like those of Michoacan, Durango, and New Mexico, smooth surfaced. The few Sevier Lake (Utah) specimens were sculptured, but so much eroded as to obscure the character of the surface. Doubtless many living springs remain to be explored and some of these may furnish special facies of this versatile form, perhaps shells with the longitudinal sculpture only. With the above facts and suggestions before us, a coming together of these various forms would, it may be assumed, lead to hybridization and the phenomenal variation of *P. protea* be thus explained. But here we must remember the fact that in all of the shells from all the localities, whatever may be the surface characters in the main, the apex and early whorls are universally smooth.

In the several hundred specimens recently received from the Flowing Wells locality, where the bodies of water are of considerable size, all of the varieties are included except Nos. 8 and 11.

From the suggestion of variation through hybridization the following hypothetical views as to the formation of sculpture may be indulged in:

The spiral sculpture or lirate character may be due to puckering of the mantle upon its being withdrawn into the shell, which would cause an increased deposit at certain points along or upon the edge of the outer lip, the lirate and intermediate depressed grooving corresponding to the wrinkling of the mantle edge. In examples that show the thread-like ridges on some whorls and not on others we may suppose that the shell-forming material, or lymph, as it may be called for convenience, was less abundant one time compared with another.

Where the double system of sculpture is exhibited the forming of the lirate ridges was at times interrupted by a short period of rest, when the rim or edge of the mouth received the greater proportion of the secretions, thus making the thread-like sculpture secondary to the longitudinal for the time being. It would seem that alternations in the volume of lymph deposited as suggested, or from pores around the edge of the mantle and possibly somewhat molded or shaped by the foot, may furnish a hint as to the various facies of sculpture.

The character of the lymph may have something to do with sculpture. It quite likely varies in density one time compared with another according to the proportions of conchiolin or lime; with the first maximum, would be greater fluidity and less tendency to set, at the expense of diffusion or quick spreading, than when the lime factor dominated and made it more viscous.

As to the proportions of the mantle and its size as related to the size of the mouth and other characters we have no certain knowledge. It may be that the edge of the mantle is thin and simple; that a series of pores occur that are parallel to but not quite at the edge of the mantle; that these pores are nearly equally spaced as to distance apart. In that case we may suppose the two forms of sculpture could be made at the same time—that is, the spiral or transverse and the longitudinal—the deposition from the mantle's edge forming on the edge of the outer lip the longitudinal plicæ and the secretions from the pores simultaneously deposited forming the liræ. In this case any differentiation in the size of the liræ—that is to say, coarseness or fineness—would be due to lack of uniformity in the size of the pores, and irregularity or differences in distance apart might be attributed to the partial or absolute congestion of some of them.

Angulation or shouldering, in some instances amounting to absolute distortion, as seen in asymmetry and bulging, are presumably due to hypertrophy of the visceral mass, especially the liver, and to entanglement at some time during the period of growth in the vegetable matter in the midst of which they live, and the flaring of the mouth, as seen in fig. 12, to the close pressing to some flat surface, like a tule stalk or the stem of some other aquatic plant.

The register number of the shells, figured 1 to 18 inclusive, is U.S.N.M. 47854.

OTHER SPECIES OF THE AMNICOLIDÆ.

There will generally be found in any collection of the Desert shells a small proportion of the following:

PALUDESTRINA LONGINQUA Gould (Pilsbry).

Amnicola longinqua GOULD, Proc. Boston Society Nat. History, Mar., 1855; BINNEY Land and Fresh Water Shells of North America, Part III, Smithsonian Miscellaneous Collections, No. 144, Sept., 1865, p. 87, fig. 173.

In Dr. Pilsbry's revised Catalogue of the *Amnicolidæ*, etc., he includes this form in the genus above named. Its presence in the desert is inconspicuous when compared with the vast numbers of *P. protea*. Those factors in the environment to which is apparently attributable the variability of *P. protea*, do not seem to affect *P. longinqua*, for all of the shells in the latter have a smooth unsculp-

tured surface. This little species is widely distributed; it occurs not only in the Colorado desert in a semifossil state, but throughout the Great Basin, living and dead, as follows: Upper Lahontan beds at south end of Winnemucca Lake, and at Buffalo Springs (Call); Nevada and Utah (Hemphill); Bear Lake and Utah Lake (Hayden, Putnam); Southeastern Oregon (Gabb); at Campo and Springs in Cuyamaca Mountains, San Diego Co. (Hemphill); Indio and other localities in Colorado desert (Stearns). Dr. Gould's specimens were collected in the "Cienaga Grande" by Prof. William P. Blake, of the Pacific Railroad surveys.

Dr. Pilsbry regards *Bythinella intermedia* Tryon, as a synonym and speaks of *P. longinqua*¹ as "extremely variable, * * * often incorrectly identified." [U.S.N.M. No. 104885.]



FIG. 2.—*AMNICOLA LONGINQUA* (Gould).

FLUMINICOLA COLUMBIANA (Hemphill) Pilsbry.

Fluminicola columbiana PILSBRY, Nautilus, XII, No. 11, March, 1899, p. 125.

Fluminicola nuttalliana var. *columbiana* HEMPHILL manuscript.

Columbia River, near Wallula and near mouth of Snake River in southwest Washington; Snake River near Weiser, western Idaho (Hemphill). Colorado desert, semifossil (Stearns).



FIG. 3.—*FLUMINICOLA COLUMBIANA* (Hemphill).

A single example was detected by me while examining the 40,000 examples of *P. protea*, etc. I had labeled it *F. nuttalliana*. It agrees so well with Dr. Pilsbry's description of *F. columbiana* that I have no doubt it belongs to that species. [U.S.N.M. No. 3847.]

The following forms collected by the Death Valley Expedition in 1891 were first made known in the report of said expedition published in 1893.² As the report has long since been out of print and many persons interested

in the study of the mollusca have never seen the descriptions or figures, it is thought advisable to republish them in this connection, although the shells have not as yet been detected in that portion of the Great Desert to which this paper in the main refers.

¹ The figure (173) in Binney is so very poor that the species could hardly be determined by it. The figures in the text numbered 2 and 3 are by Dr. McConnell. The latter form has not been figured before.

² North American Fauna No. 7, Part II, U. S. Dept. Agriculture, pp. 269 to 283.

Through the courtesy of the Hon. James Wilson, Secretary of Agriculture, and the kindness of Dr. C. Hart Merriam, chief of the Biological Survey of above Department, I am able to present the figures of these species.

AMNICOLA MICROCOCCUS Pilsbry.

Shell minute, globose, with short conic spire and narrow umbilicus. Whorls $3\frac{3}{4}$, convex, especially below the sutures, the apex very obtuse. Surface smooth, light olive colored. Aperture ovate, about half the length of the entire shell, bluntly angulated above; the inner lip is either free from the preceding whorl or in contact only at the upper part.

Alt. 1.5, diam. 1.3 mm.



FIG. 4.—AMNICOLA MICROCOCCUS (Pilsbry).

A smaller species than *A. granum* Say, with oval instead of round aperture and shorter spire.

Type from small spring in Oasis Valley, Nevada (U.S.N.M., No. 123622), by Dr. C. Hart Merriam. June, 1891. Collected also in Death Valley by Nelson and Bailey, February 4, 1891 (U.S.N.M., No. 123904).

Several examples of this interesting little shell were detected as above.

FLUMINICOLA MERRIAMI Pilsbry¹ and Beecher.

Shell small, globose turbinate, narrowly but distinctly and deeply umbilicated. Spire low conic, acute; whorls four, slightly shouldered below the sutures, the upper lateral portion rather flattened, periphery and base convex. Surface smooth, horn-colored. Aperture oblique, ovate, angled above, broadly rounded below; upper portion of the inner lip adherent to the body whorl, lower portion arcuate, without a callous thickening.

Alt. 3, diam. $2\frac{1}{2}$ mm.

This species differs from *F. fusca* Haldeman in the much more distinct umbilicus, thin texture, and the *nonthickened* lip.

Collected from a warm spring (temperature 97° F.) in Pahrnagat Valley, Nevada, by Dr. C. Hart Merriam, May 25, 1891 (U.S.N.M., No. 123626).

Dr. Merriam detected in the same spring numerous living examples of the long-sought-for *Tryonia clathrata* Stimpson, previously known only by dead or semifossil examples collected by Prof. William P. Blake in 1855 and General Carlton in 1861–62. It is quite evident that the term “Colorado desert,” as used in connection with the Blake-Carlton shells, included a much larger part of the Great Basin than is now understood when the “Colorado desert” is mentioned. Attention is again called to the figure “139, *Tryonia clathrata*,” as given in Binney,² which does not represent Dr. Stimpson’s shell; for



FIG. 5.—FLUMINICOLA MERRIAMI (Pilsbry and Beecher).

¹ The Nautilus, V, Apr., 1892, p. 143; also XII, Mar., 1899, p. 121 *et seq.*

² Smithsonian Miscellaneous Collection, No. 144, p. 71, Sept., 1865.

a proper figure see the last author's Researches upon the Hydrobiinæ,¹ etc., page 48.

THE PHYSAS.

Associated with *Paludestrina* and scattered far and wide over the desert in immense numbers are various forms of *Physa*. Though less numerous than the former, they are particularly abundant in the depressed portion (below sea level) from Indio to Volcano Springs, their larger size making them far more conspicuous. The desert is strewn in like manner with the dead shells of *Planorbis* and *Anodonta*, far to the south, along the course of New River especially. This distribution extends to the "dry lake," the before-mentioned Laguna Maquata, south of the United States boundary line, where Mr. Orcutt observed "along the bottom of the lagoon numerous examples of the same species of *Physa*, *Planorbis*, and *Anodonta*" that are found at the north. He also mentions the occurrence of certain marine shells, *Tagelus* and *Cylichna*. The first of these, as well as a single example of *Ocenebra poulsoni* Nuttall, were collected by me near Indio.

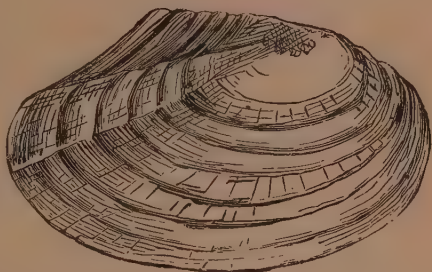


FIG. 6.—*ANODONTA CALIFORNIENSIS* (Lea), somewhat reduced.

Regarding the large *Planorbis ammon* Gould, Mr. Orcutt found it "about equally abundant * * * in a fossil state with *Physa humerosa*." At the stations where I collected both *P. ammon* and *P. gracilentus* Gould (? = *P. liebmanna* Dunker) were apparently scarce. So also with *Paludestrina longinqua* (= *Amnicola longinqua*) Gould.

The surface of the desert in the neighborhood of these localities and for miles beyond those visited by me is covered with the glittering fragments of *Anodonta californiensis* Lea, which form a noticeable feature of the region, as seen from the moving cars. Perfect valves are frequently met with.

Probably there is no area of equal extent on the face of the earth where such an immense number of shells of the genera above named may be seen. Millions of the tiny shells of *Paludestrina*, with their varied and beautiful sculpture and the countless thousands of many species and varieties of *Physa*, indicate this region above all others that are known as the metropolis of these groups and prove that the environmental conditions throughout this vast territory must have been preeminently conducive to their multiplication and development.

While the *Physas* of the desert, as before remarked, are, as a whole, rather above the average of their congeners elsewhere in point of size,

¹Smithsonian Miscellaneous Collection, No. 201, Aug., 1865.

the maximum of development in this direction is farther to the south, as shown by the fine, large, highly polished shells of the west Mexican species *P. (Aplexa) aurantia* Carpenter, of Mazatlan. This form, which the author remarks as "not common" at that place, sometimes measures nearly an inch and a half in length.¹ As *Limnæa stagnalis* and *L. megasoma* of more northerly latitudes exhibit the culmination in size of the *Limnæidæ*, so in the south does *P. aurantia* of the *Physidæ*.

That several species of *Limnæa* occur at numerous localities in the Great Basin to the north, at various elevations from 1,300 to 4,000 feet² and upward, and eastward in Arizona at Tucson, elevation 2,300 feet, to the higher altitude of Walker Lake, in the San Francisco Mountains, 8,250 feet, and (*L. bulimoides*) still nearer, both in distance and altitude, at Daggett, on the Mojave River, in the Mojave Desert, 2,000 feet, points to the thermal factor of the lower levels in this region as the uncongenial feature which excludes *Limnæa* from the desert. Thus *L. humilis* becomes a mountain species in the Sierra Laguna of Lower California, and other species of the genus occur to the southward not far from the coast, at lower levels, within reach of the cool winds and fogs of the Pacific. Evidence is not wanting to show that depauperation in the *Limnæa* is coincident with high thermal conditions,³ where such temperatures are continuous or prevail the greater part of the year.

In considering the *Physas* of Indio and other desert localities, a glance at Plate V shows many forms that are familiar to students of North American *Limnophila*. To facilitate comparison, on Plate IV are presented several figures from Binney⁴ of described species from regions both north and south of the desert. With the distributive agencies previously indicated in mind, it may be well to turn to these forms and note the localities at which they were detected. Call credits *P. gyrina*, which he suggests is a variety of *P. heterostropha*, to the Upper Bonneville beds, near Salt Spring Creek, and the variety *P. elliptica*, to Warm Spring Lake, near Salt Lake City, both places in Utah. Of the latter he says it occurs "abundantly and of large size." The same author remarks of *P. heterostropha* that it has not been found in the lake beds of either Bonneville or Lahontan, but is abundant as a semifossil on the surface of Sevier Desert. Both *P. heterostropha* and *P. gyrina* were found living by the Death Valley expedition at many places in the Great Basin much farther south than the Lahontan and Bonneville regions. *P. heterostropha* was collected

¹ Over a hundred were obtained by me at Acapulco in 1868. [R. E. C. S.]

² Mr. Vernon Bailey collected *L. palustris* in the Uintah Mountains in a creek at an elevation of 10,000 feet.

³ Doubtless great extremes of temperature in either direction are detrimental to the existence of these forms.

⁴ Land and Fresh Water Shells of North America, Smithsonian Miscellaneous Collections, No. 143, Part II, 1865.

by Mr. Vernon Bailey among moss "in an irrigation ditch" at Phoenix, Arizona, and by the same party at Magdalena, northwestern Mexico, "in a similar situation." It has been reported from other places in Mexico, as well as from Hot Springs, Lower California, where it was detected by H. and C. R. Orcutt in 1882.

P. lordi "is rare as a fossil; it does not occur living in the Bonneville Basin; a few examples have been found on the surface of the Sevier Desert."

For the distribution of the following I quote Dr. Cooper's catalogue.¹ "*P. gabbi*, northern California to Lower California. * * * *P. ampullacea*, Columbia River, latitude 49°, to Owens River, California. * * * *Physa diaphana*, Lake County, Cal., to Cape St. Lucas. * * * *Physa virginea*, Oregon and northwestern California to Santa Barbara, Cal."

Call found *P. ampullacea* common, living in the Bonneville area; it is found also in the Mono Basin, California. *P. gabbi* was collected by Professor Gabb in the Santa Ana River, Los Angeles County; *P. osculans* in Devils River, Arizona (Lloyd), and at Del Rio, Rio Grande Valley (Bailey); *P. mexicana*, "from Seven Wells, the Colorado River, and the Santa Cruz River near Tucson, Ariz., at Laguna, 20 miles north of Campo, and at Cameron's ranch, San Diego County, Cal. Some strongly shouldered specimens in a subfossil state, from the Colorado Desert, are perhaps a variety of this species, which is extremely variable" (Dall). Professor Dall also identifies a single specimen of a physoid form collected by Dr. E. A. Mearns in the drift of the Santa Cruz River near Tucson, Arizona, as *Aplexa hypnorum*.²

Physa virgata, described from specimens collected by Dr. Webb in the Gila River, Arizona; also occurs near San Diego and at Los Angeles, where I have collected numerous specimens.

Physa distinguenda, a species with which I am not familiar, was reported by Mr. Orcutt as occurring in a little creek near San Diego in 1890.

Of the 56 figures in Plate XXIII, Nos. 1, 2, and 3 have been made from a lot of 492 collected by Prof. I. C. Russell at Pyramid Lake, Nevada, in the extinct Lahontan Lake region. These give a fair idea of the differentiation of *Physa humerosa* from that locality, a species quite persistent in its main characteristics, first described from the Colorado Desert by Dr. Gould. The other figures represent examples forming a second selection from over 1,500 individuals collected by the writer,

¹ Catalogue of West North American and many Foreign Shells, etc. Printed for the State Mining Bureau, Sacramento, April, 1894.

² This extends the distribution of *hypnorum* by an immense leap to the south, its previous most southerly locality considered. It may possibly be shown by additional examples to be a long spired variety of *alata*, which is found in Lower California, or a slender aspect of *nitens*, a Mexican species.

a first series, which exhibited the extremes and other aspects of variation more markedly, having unfortunately been misplaced.¹

A fair idea of the size as a whole is not given by the plate, the examples selected being simply to illustrate variation; they are considerably under the average.

SCULPTURE AND SALINITY.

The presence of sculptural characters in the *Physidae* is of rather rare occurrence, though frequently met with in many species of the *Limnæidae*, which sometimes exhibit much diversity within quite limited geographical areas. While the Paludestrinæ of the desert are so conspicuous in prominence and diversity of sculpture, the Physas, on the contrary, show only the usual incremental lines more or less defined. The following species of *Physa*, as described by various authors,² are said to be sculptured: *P. costata* Newcomb, from Clear Lake, California;³ *P. lordi* Baird, Lake Osoyos, British Columbia; *P. vinosa* Gould, Lake Superior; *P. plicata* De Kay, Manhattan Island; *P. solida* Philippi, New Orleans.

In all of the foregoing, excepting Dr. Newcomb's *P. costata*, the sculpture consists either of fine liræ or indented grooving, which crosses the incremental striæ or lines of growth. This is what I have called *transverse* sculpture.

The elevation of Clear Lake is 1,350 feet, with an area of 80 square miles. It is subject to only slight fluctuations in volume.

The incremental striæ, though sometimes quite conspicuous, are ordinarily exceedingly fine or nearly obscure. They can only be regarded as sculpture in a negative sense. These are, of course, longitudinal, being parallel to the axis of the shell, or nearly so. In some instances "fine broken microscopic wrinkles parallel to the lines of growth occur," as mentioned by Philippi in his description of *P. mexicana*. *P. philippii* Küster is described as having "waving wrinkles."

Where these forms of sculpture are present the result is seen in a more or less finely decussated or reticulated surface, which may extend over a part or cover the entire surface of the shell, the latter rarely.

Dr. Newcomb's *Physa costata* is the only species which exhibits really conspicuous longitudinal sculpture. In this regard it is a remarkable exception to all others of the *Physidae*. It is a very pretty

¹ See Plate xxiv.

² See Binney's Land and Fresh Water Shells of North America, Part II, Smithsonian Miscellaneous Collections, p. 143.

³ Dr. Cooper, who collected some fifteen species of mollusks in Clear Lake, says: The borax, soda, alum, iron, sulphur, etc., found around the lake, do not affect the taste of the water, and do not seem to influence animal life except in limited spots where no mollusca are found, perhaps on account of subaqueous mineral springs. Proc. Cal. Acad. Science, IV, p. 154.

form, with ten to fourteen regularly occurring rounded undulations or ribs. Hemphill's *Pompholyx costata*, from near the Dalles of the Columbia River, has the same sculpture.

Another sculptural aspect that is not infrequently met with is what has been termed malleated.

De Kay's *P. plicata*, "in some specimens," exhibits "distinct square facets." *Physa carltoni* Lea, from near Antioch, at the junction of the Sacramento and San Joaquin rivers, is sometimes malleated. In *P. malleata* Tryon we have another illustration.

All of the various sculptural aspects above described occur also in the *Limnæidæ*, of which the following species may be named: *L. caperata*, *L. catascopium*, *L. columella*, *L. decollata*, *L. emarginata*, *L. elodes*, *L. lanceata*, *L. lepida*, *L. nuttalliana*, *L. palustris*, *L. sumassi*, *L. umbrosa*, and innumerable varieties or races of the above, and in Call's fossil *L. bonnevillensis*, from the quaternary of the Great Basin and his living *L. (Radix) ampla*, var. *utahensis* from Lake Utah.

It will be observed by reference to the descriptions of the many species of *Physa* herein quoted that no mention of salinity is made in connection with the waters in which the shells were found; the same remark also applies to the various species of *Limnæa* above named. Regarding the latter we find the longitudinal, transverse or spiral sculpture, the latter either incised or produced. The malleated aspect, etc., in *L. ampla*, and these in many and various aspects of differentiation in *Limnæa emarginata*, as may be seen in the National Museum (Cat. Nos. 123887 to 123894, inclusive).

In the large series from Eagle Lake¹ in central Minnesota, where neither saline or thermal conditions need to be considered, nearly all, if not all, of the sculptural characters that occur in the numerous species of *Physa* and *Limnæa*, above cited, are present, besides such features as relate to form and solidity.

The partially or wholly malleated surface so often met with in the *Limnæids* regardless of altitude or the salinity of the water, and less frequently in the *Physas*, is explainable by the character of the lake or pond bed in which these dented forms occur. The character of the bottom, even in a pond of limited size, often exhibits very considerable differences in the matter of compactness or density; alluvial mud, clayey mud, clay or sand, with fine or coarse gravel intermixed with fragments of aquatic plants and plant stems in varying proportions. The habits of these mollusks include, if not properly speaking burrowing, wallowing or submersion, and moving as they do with somewhat of a rotating motion, this, combined with the moderate impact of the surrounding matter, contribute to produce the malleated or dented surface, which frequently exhibits a somewhat spiral arrangement.

¹Proc. U. S. Nat. Mus., XXII, No. 1190.

The late Dr. James Lewis "attributed malleation to rapid growth in warm water, causing the shell to solidify unevenly. He also mentioned apparent metamorphoses of one species into another quite different, merely from change out of still canal water to that of a rapid brook."

Neither Dr. Lewis's hypothesis nor Call's *Limnea bonnevillensis* and the same author's variety *utahensis* of *L. ampla*, the latter occurring in an environment wherein salinity is a factor, are of much value as bearing on the phenomena of sculpture in these and related forms in the face of the Eagle Lake shells before referred to and Lea's *Physa carltoni* from near Antioch, at the junction of the San Joaquin and Sacramento rivers in California.

SCULPTURE AND THERMAL WATERS.

Physa frequently occurs in thermal springs or waters far above their ordinary summer temperature. Dr. Lea's *P. aurea* from Hot Springs, in Bath County, Va., included by Binney as a synonym of *P. heterostropha*, is an instance in point. Here waters of different temperatures come together forming a little stream—on one side of 106°, the other, 56°. Dr. Lea made no note of sculptural differences. Numerous examples of another form from a hot spring in Alameda County, California, examined by me, showed only fine growth lines. Dr. Merriam's specimens of *P. gyrina* from Hot Springs, Panamint Valley, California, "fine, large, dark-colored shells," exhibited no special sculptural features, and the same may be said of Bailey's examples of *P. heterostropha* from the same region. From the above we may conclude that sculptural character is not affected or developed by the thermal factor in springs, etc., and this is still further supported by the desert shells, which, outside of the hot springs, were subjected to the sun-heated waters of the shallow pools during the long and excessively hot summers of the desert region.

Incidentally, mention may here be made that the shells of *Physa* from thermal stations are noticeable for their fine texture, shining surface, and clear dark or light amber color.

SIZE AS RELATED TO HYPSONETRIC TEMPERATURES.

"Hypsometric distribution has received from conchologists," as Dr. Call has said, "much less attention than it apparently deserves. Within small areas, comparatively, there are presented by hypsometry those various physical conditions that must otherwise be sought through several degrees of latitude."

So it may be said that the paths of distribution of various living forms are along the lines of temperature, measurably, wherever such lines may lead, which may explain the southing of many so-called Northern species and the northing of so-called Southern forms, with

but little regard to lines of latitude. While altitude, which in this connection is equivalent to decreased temperature, has apparently no sculptural influence, it seems to bear a close relation to size in the *Physas*. That aspect of depauperation called dwarfing is shown in Call's (Table XIV) comparative measurements¹ of *Physa ampullacea* from Little Gull Lake, in the Mono Basin of California, altitude 7,000 to 7,500 feet, and Church Lake, near Salt Lake City, Utah, elevation about 4,300 feet, the ratio of lengths being $\frac{14.95}{12.97}$ and the ratio of widths $\frac{9.81}{8.45}$. The value of this comparison is impaired, first, because

the number of examples from these places is unequal, being only twelve from Gull Lake against eighteen from Church Lake, and, second, because a comparison of this kind to be satisfactory should embrace a much larger number of individuals.

As to the relation between depauperation and salinity, Call's table (XI) giving the measurements of thirteen examples of *Physa gyrina* from ponds near Salt Lake City, elevation about 4,500 feet, and thirty-nine specimens from brackish springs at Promontory, elevation 4,900 feet, the same objections apply. His tables (VI, VII, VIII, IX, X, and XI), based on comparative measurements of *Pompholyx effusa*, *Carinifer neoberryi*, *Helisoma trivolvis*, *Limnophysa palustris*, and *Physa gyrina*, indicate, as he says, that "brackish water is correlated with depauperation."² While numerous examples of *P. gyrina* collected by Dr. C. Hart Merriam in Bennett Springs, Meadow Valley, Nevada, elevation 6,000 feet, and the large number (492) of *P. humerosa* from Pyramid Lake, 4,890 feet altitude, after comparison with Colorado desert shells of the same species, are affirmative testimony as to the dwarfing influence of higher altitudes (i. e., lower temperature), the desert shells being uniformly of larger size. This applies not only to the species just named, but to the desert *Physas* as a whole. Hypsometric or lower temperatures neutralized by thermal conditions, as related to size in the *Physas*, is illustrated by the examples of *P. gyrina* collected by Dr. Merriam at the Hot Springs in Panamint Valley, the shells being fine, large, and dark colored. Here the altitude above the level of the desert was not so very great, being about 1,500 feet. Call's Warm Springs, Utah, specimens of *P. gyrina* var. *elliptica* afford a similar illustration. "The variety" he says, "is found abundantly and of large size." The elevation of Warm Springs is over 3,800 feet.

From the consideration of the relations of sculpture to salinity and to thermal waters, of size in connection with hypsometric distribution, variation in form as related to environment attracts attention.

¹ A comparison between forms from high altitudes with those from stations nearer to the level of the sea would be more satisfactory than that above quoted, where both localities are mountain stations.

² This point discussed elsewhere.

VARIATION IN FORM.

The *Physas* of the desert, however affected by the environment, in the matter of sculpture are absolutely wanting in the characters so conspicuous in the *Paludestrince*. Evidence of hybridization is at once suggested when a large number of individuals is compared. Distortion and pathologic deformity are of frequent occurrence, and are exhibited in the strong shouldering of the basal whorl and the bulging of the latter, which is not uncommon, as in certain California species of *Linnæa* from sweet waters. This aspect of deformity may be attributed to abundance of food supply, resulting in hypertrophy of the viscera. The surface of the shells may sometimes be uneven and the incremental striæ be coarse, as the whole is heavier than is usual in the shells of this genus from ordinary localities or stations. These characteristics are apparently due to the environment, but sculpture in the proper sense is not manifest. The excess of mineral matter in the waters is exhibited in greater solidity and a sturdier growth.

The *Physas* of the Great Basin from the extreme north to the Colorado River and beyond show a notable tendency to shortness of spire and shouldering or symmetrical bulging and flattening of the upper part of the basal whorl. These characters, when pronounced, approach distortion. Normal or typical individuals of *P. humerosa* exhibit these features moderately. *P. virgata* Gould, from the River Gila and near San Diego and at Los Angeles, a not remote neighbor of *P. humerosa*, which may be regarded as a less chunky aspect of the latter, show these peculiarities still less. Both *P. heterostropha* and *P. gyrina*, if these may be called different species, in some localities within the area above mentioned show moderate tabulation of the basal volution, with spires of variable height. *P. lordi*, sparsely represented in the Great Basin, is a conspicuous illustration of the low-spired ventricose body whorl type.

In this connection attention is called to figs. 1 to 10 on Plate XXIV, and the modification of the shell through hypertrophy is forcibly suggested by some of the figures on the same plate.

A glance at Plate XXIII and a comparison of the figures therein exhibits the range of variation from the low-spired, rather chunky shells of *P. humerosa* 1 and 10 to the elongated forms (approaching *P. gyrina*) *P. virginea* 53, 55, and 56, while 18, 23, and 26 may be assigned to *P. mexicana*. In fig. 29 we have a typical *humerosa*. Figs. 51 and 54 may be regarded as robust examples of *P. heterostropha*, while hybridization is suggested by many of the intermediate forms not specified above.

Cooke gives several figures¹ illustrating the effect of salinity upon *Linnæa peregrina* and *L. stagnalis* from the salt marshes near the sea.

¹ Cambridge Natural History, III, 1895, p. 85.

of Aral, and our desert *Physas* exhibit similar, if not as extreme, distortion. With the latter, as heretofore intimated, the abnormalities are quite as likely to be due to visceral hypertrophy through overfeeding as to the salinity of the waters.

To illustrate any species of *Physa* by a single figure is, in the present state of our knowledge of the susceptibility of the mollusks of this family to environmental influences, quite an absurd thing to do. While the shells of a colony of any one species inhabiting a spring or pool of limited area might be nearly or quite uniform in size, shape, texture, and color, another colony of the same species not very far distant, at a slightly higher or lower elevation, may present very considerable variation in one or more of these characters.

This variation or tendency thereto is sometimes exhibited when a large number of individuals are brought together from a pond or spring of large area where the volume of water is subject to seasonal mutations. Binney in illustrating *Limnæa palustris*¹ and certain other species of this genus has very properly given several figures. The same course is necessary in the *Physas*.

In Plate XXII, which follows, may be seen the figures of the types of several species, as given by Binney,² which will facilitate comparison with the figures in Plate XXIII and enable the student to draw his own deductions, though, as before stated, no species of *Physa* can be satisfactorily illustrated by a single figure, however accurately drawn.

The following notes have reference to the figures on Plate XXIII:³

No. 7. Upper part of basal whorl extremely tabulated; variation from *P. humerosa*?

No. 8. Basal whorl flattened; apex depressed and short; the same features less pronounced exhibited in 9 and 10.

No. 11. Apex short; basal whorl rounded.

No. 12. Much like a large ten; apertures patulous and reflected below.

Nos. 21, 27, 28, and 49. Outer lip pinched above and sinuous.

Nos. 28, 39, 46, and 47. Heavily calloused on body whorl, forming with the outer lip a nearly continuous rim.

No. 33. Anterior portion of aperture or lip thrice repeated; see also fig. 4 in Plate VI.

Through the courtesy of the Secretary of the Smithsonian Institution the author has been permitted to use the cuts in Plate XXII; he is also indebted to Prof. W. H. Dall and Mr. C. T. Simpson of the U. S. National Museum for kind attention to various matters on several occasions.

¹ Land and Fresh Water Shells of North America, Part II, p. 47, and elsewhere.

² Idem, p. 75, et seq.

³ The majority of the forms have been compared with material in the National Museum; those not referred to in the index or notes are left to the judgment of the reader. Many of the determinations may be regarded as arbitrary; criticism on this point is excusable.

THE PLANORBES.

Of the numerous species of *Planorbis* inhabiting North America, the larger forms occur west of the Rocky Mountains and north of lat-

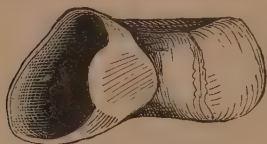


FIG. 7.—*PLANORBIS TRIVOLVIS* Say (original).

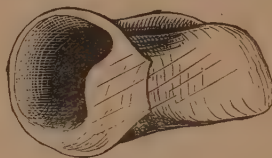


FIG. 8.—*PLANORBIS TRIVOLVIS* Say, distorted (original).

itude 30° N. Thus we find *P. (Helisoma) trivolvis* of conspicuous size, as is shown by the accompanying figures. These represent examples from the cool waters of mountain lakes where the elevation is about 5,000 feet.

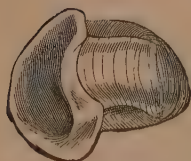
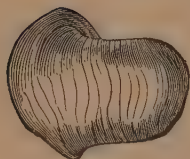
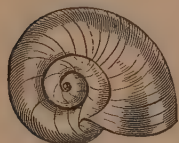


FIG. 9.—*PLANORBIS AMMON* (Gould).

Another characteristic form peculiar to the West coast is *P. (Helisoma) ammon*. The metropolis of this species is apparently the Colorado Desert where, as previously stated, it is found in the greatest abundance. It is distinguished not alone by its rugged and rather irregular growth, but by the mass of the soft parts as seen in living examples, which probably exceeds that of any other species. In the case of this form we find it scattered over a large area at 200 feet below the level of the sea, where the waters of contiguous springs have a temperature of 100° F.

These forms exhibit a swollen ventricose irregularity and patulous expansion of the aperture attributable to visceral hypertrophy, quite as likely as to salinity, and the distortion of the example of *P. trivolvis*, above figured, is presumably due to the same cause, as the specimen was collected in the sweet waters of a mountain lake.

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EXPLANATION OF PLATES.

The figures are all largely magnified. The length of the actual specimens, Nos. 1 and 2, are respectively twenty and sixteen hundredths of an inch; the diameters of the same, nine and six hundredths of an inch. The robust example, 18, is 0.23 by a diameter of a trifle over 0.1 of an inch. These dimensions exceed the average of any large number of shells. Particular attention is called to the variation in size and form of the aperture. The figures were all drawn by Dr. J. C. McConnell, whose skill and taste are too well known to require praise.

PLATE XIX.

Paludestrina protea Gould.

Slender, elongated forms with rounded whorls.

- Fig. 1. Whorls smooth, without sculpture.
 2. Same as above, dwarfed form.
 3. Whorls spirally threaded or lirate.
 4. Shorter form of same.
 5. Middle whorls cancellated, basal whorl threaded sculpture only.
 6. Longitudinal sculpture strongest throughout.

PLATE XX.

Paludestrina protea Gould.

Whorls angulated or tabulated above.

- Fig. 7. Surface smooth, upper portion of whorls angulated.
 8. Surface smooth, strongly angulate (unique example).
 9. Robust form slightly angulated above and faintly threaded.
 10. Rather slender form, strongly angulated and conspicuously threaded.
 11. Whorls flattened or tabulated above, and faintly threaded throughout (unique example).
 12. Whorls angulated above, basal and penultimate whorl, faintly threaded. The two whorls above these sculptured both ways; the mouth rimmed and reflected (a very rare form).

PLATE XXI.

Paludestrina protea Gould.

- Fig. 13. Whorls angulated above and exhibiting the two systems of sculpture, which in the middle whorls are subnodose at points of crossing.
 14. Longitudinal sculpture strongest; plications on middle whorls less numerous and farther apart than on basal whorl.
 15. Short form, with strongly latticed sculpture on principal whorls.
 16. Whorls angulated above, sculpture like middle whorls of thirteen.
 17. Robust form, angulated above, faintly threaded; longitudinal sculpture consisting of rather inconspicuous rounded swollen plications.
 18. Robust, angulated above, the middle of the whorls sculptured both ways, the lower part of basal whorl faintly sculptured transversely.

The various examples above figured are connected by an endless chain of intermediate forms.

PLATE XXII.

Recognized species of *Physa*.

The figures on this plate are taken from Binney's Land and Fresh Water Shells of North America, Part II, Smithsonian Institution Miscellaneous Collections No. 143, Washington, September, 1865. The numbers in parentheses and the page numbers correspond with those in the above publication.

- Fig. 1 (127). *Physa lordi* Baird (p. 76).
- 2 (128). *Physa gabbi* Tryon (p. 77).
- 3 (129). *Physa gabbi* Tryon (p. 77).
- 4 (130). *Physa gyrina* Say (p. 77).
- 5 (133). *Physa ampullacea* Gould (p. 79).
- 6 (134). *Physa ampullacea* Gould (p. 79).
- 7 (135). *Physa ampullacea* Gould (p. 79).
- 8 (139). *Physa ancillaria* Say (p. 81).
- 9 (140). *Physa obesa* De Kay (p. 82).
- 10 (142). *Physa osculans* Haldeman (p. 83).
- 11 (143). *Physa mexicana* Philippi (p. 83).
- 12 (144). *Physa heterostropha* Say (p. 84).
- 13 (146). *Physa osculans* Haldeman (p. 85).
- 14 (156). *Physa virginea* Gould (p. 92).
- 15 (157). *Physa humerosa* Gould (p. 92).
- 16 (158). *Physa virgata* Gould (p. 93).
- 17 (168). *Physa nitens* Philippi (p. 98).

PLATE XXIII.

Variations of desert *Physidæ*.

- Figs. 1, 2, 3, 5, 10, 17. *P. humerosa* and ordinary varieties.
- 7. *P. humerosa*, extreme variation.
 - 29. *P. humerosa*, typical; compare with Binney's fig. 157.
 - 14, 16, 17. *P. humerosa*, unusually large.
 - 44, 46, 50, 52. Compare with *P. ampullacea*, Binney's 133.
 - 53, 55, 56. *P. virginea*; compare with Binney's 156 and same author's 129, *P. gabbi*.
 - 24. *P. mexicana*; compare with Binney's 139, *P. ancillaria*.
 - 6, 8, 9. *P. humerosa*, abnormal, very short apex, etc.
 - 24, 26. *P. mexicana*, nearly or quite typical; see Binney's 143.
 - 13, 18, 22, 23. *P. mexicana*, ordinary varieties.
 - 8, 27. Hybrids of *humerosa* and *mexicana*, or varieties of either.
 - 54. *P. heterostropha*, robust form, approaching *ampullacea*.

PLATE XXIV.

Variations of desert *Physidæ*.

The figures in this plate, illustrating diversity of form, were drawn by the author from specimens collected by Prof. George Davidson¹ at or near Indio in 1883, and referred to on page 290 as a "first series." The shells are now unfortunately misplaced or destroyed; but the drawings were made soon after they were received.

Fig. 1 is very near to fig. 7 in Plate XXIII and represents an extreme variation from *P. humerosa*.

- 3 is unique in being the only specimen of this form or shape.
- 4 may be compared with fig. 33 of Plate XXIII, showing a triple repetition of the anterior part of the aperture.
- 5-10. Varieties of *P. humerosa* or *P. mexicana*, or hybrids of the two species.
- 11. Another rare variety; should be compared with *P. osculans*, Binney's 142.
- 12, 13, 13a, 14, 14a, 14b. Varieties of *P. heterostropha* from sweet water.

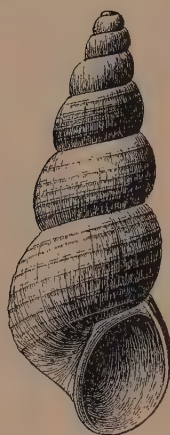
¹ American Naturalist, October, 1883, p. 1014 et seq.



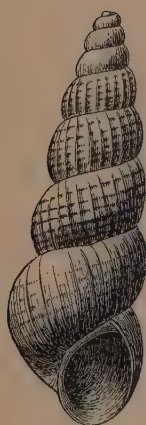
1



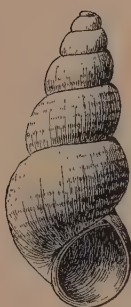
2



3



5



4



6

VARIETIES OF *PALUDESTRINA PROTEA* GOULD.

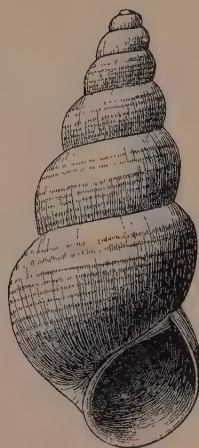
FOR EXPLANATION OF PLATE SEE PAGE 298.



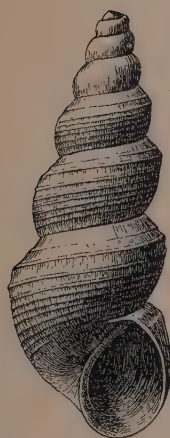
7



8



9



10



11



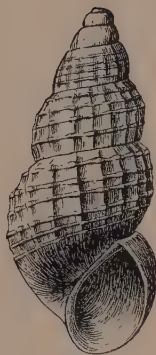
12

VARIETIES OF *PALUDESTRINA PROTEA* GOULD.

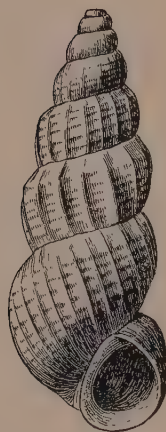
FOR EXPLANATION OF PLATE SEE PAGE 298.



13



15



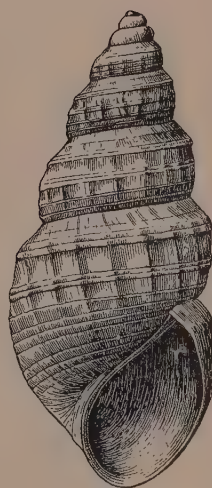
14



17



16



18

VARIETIES OF *PALUDESTRINA PROTEA* GOULD.

FOR EXPLANATION OF PLATE SEE PAGE 298.



1.



2.



3.



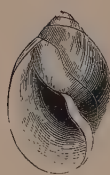
4.



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11.



12.



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14.



15.



16.



17.

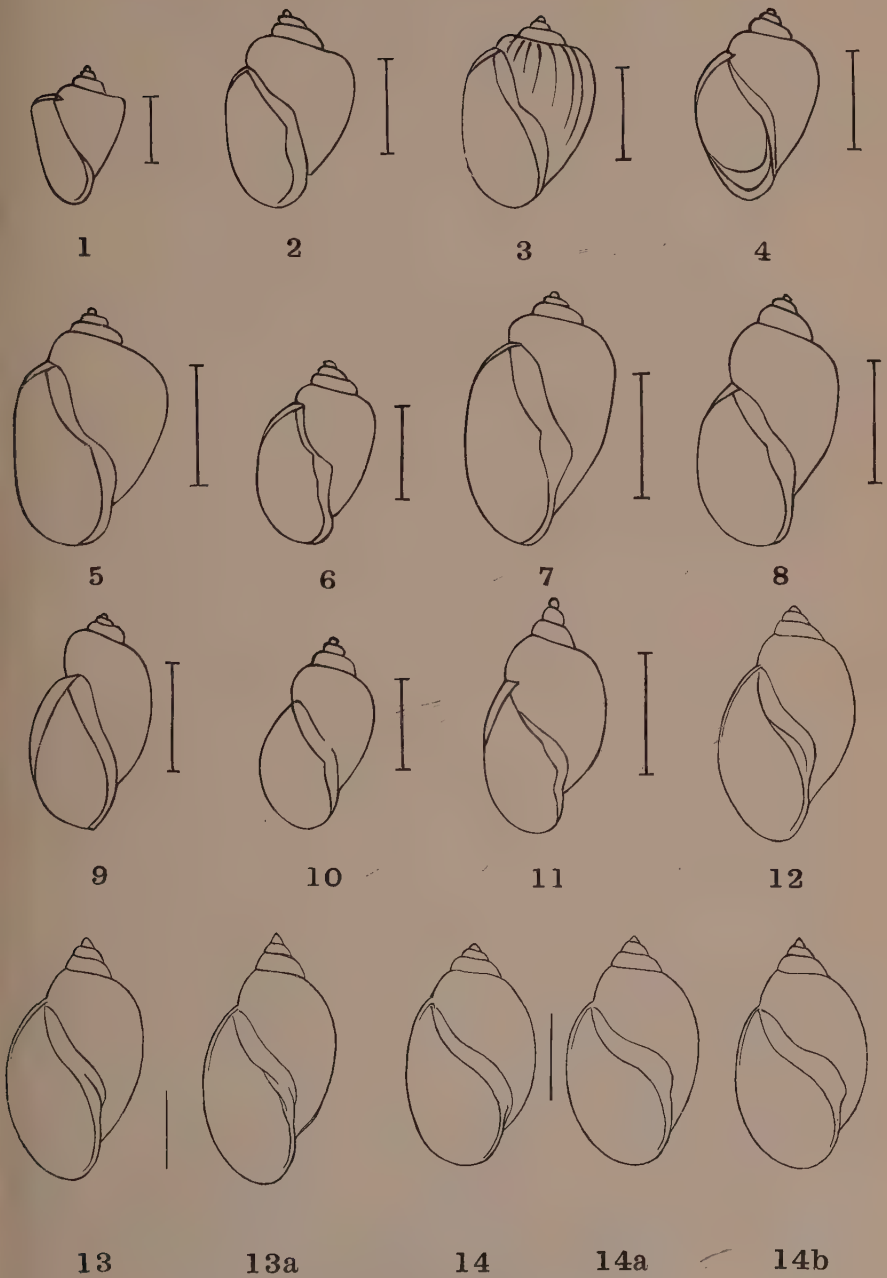
AMERICAN SPECIES OF PHYSA.

FOR EXPLANATION OF PLATE SEE PAGE 299.



VARIATIONS OF DESERT PHYSIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 299.



VARIATIONS OF DESERT PHYSIDÆ.

FOR EXPLANATION OF PLATE SEE PAGE 299.

CHONDRODONTA, A NEW GENUS OF OSTREIFORM MOLLUSKS FROM THE CRETACEOUS, WITH DESCRIPTIONS OF THE GENOTYPE AND A NEW SPECIES.

By TIMOTHY W. STANTON, Ph. D.,

Paleontologist, U. S. Geological Survey.

A peculiar group of fossils that has hitherto been referred to the genus *Ostrea* has for some years been known to occur in the Cretaceous of southern Europe and of Texas. Attention was first prominently called to it by Choffat's description and figures of *Ostrea joannæ* from Portugal. The very similar form from Texas has been described by Hill as *O. munsoni*, and almost simultaneously by Cragin as a part of *Hippurites flabellifer*. Similar forms, to which reference will again be made, have been found in the Venetian Alps.

All these fossils have the general shape of *Ostrea*, but are very thin compressed forms, with the two valves similar and almost invariably still attached to each other, and with rather prominent dichotomous ribs. That this peculiar sculpture is not essential to the group, however, is proved by the occurrence of the smooth species described in this paper.

In connection with my general work on the invertebrates of the Comanche series, I have restudied *Ostrea munsoni*, examining the types of Hill and Cragin, together with a larger suite of specimens collected by myself near Austin and a few obtained by Messrs. Hill, Vaughan, Prather, and others at various points in Texas. By means of polished sections and by carefully cutting away the upper valve from a number of specimens, with the study of fragments and accidental fractures, it has been possible to determine satisfactorily most of the internal features of the shell and to prove that the species is not an *Ostrea* nor referable to any described genus. The new generic name *Chondrodonta* is therefore proposed with *Ostrea munsoni* Hill as the type. The new species described on a following page, though differing greatly in external appearance, has the same hinge structure, and

is referred to this genus. Authentic examples of *Ostrea joannæ* also show the characteristic hinge structure of *Chondrodonta* as seen in cross section. The collections referred to, except the types of Hill and Cragin, are in the United States National Museum, and this notice is published here by permission of the Director of the United States Geological Survey. The descriptions of the genus and of the two American species follow.

CHONDRODONTA, new genus.

Shell of rather large size, sessile, ostreiform, attached by the left (?) valve; texture, subnacreous; hinge plate greatly elongated, without proper teeth, but with a long chondrophore in each valve a little back of the median line, extending from the beak across the hinge plate and projecting considerably beyond it into the body cavity, the chondrophore of the attached valve forming the overhanging anterior wall of a deep, narrow groove into which is received the chondrophore of the upper valve in the form of a rather thin oblique lamella, whose free edge is slightly curved upward. Near their umbonal ends the chondrophores are nearly in contact, but toward their other extremities they are separated by a space of from 1 to 3 millimeters (according to the size of the shell). This space must have been filled by the resilium, which was evidently attached to the under side of the chondrophore in the lower valve and to the upper side of that in the free valve, the whole forming an interlocking arrangement that could have allowed very little motion of the valves, and is effective even after the resilium has disappeared, for the two valves are almost invariably found firmly united.

Pallial line remote from the margin, as in *Pectinidae*, *Spondylidae*, etc., usually not very distinctly marked; adductor muscle doubtless single, though its faint impression has not been positively recognized; lower valve, moderately convex; upper valve, flat or concave, so that the body cavity is very shallow; surface, either with radial, irregularly dichotomous plications, or nearly smooth, with only concentric growth lines.

Type.—*Ostrea munsoni* Hill, from the Edwards limestone of Texas; also represented by *Chondrodonta glabra*, new species, from probably the upper part of the Glen Rose limestone near Kerrville, Tex. European representatives of the genus are *Ostrea joannæ* from Portugal, probably *O. aff. munsoni* (Hill) Boehm, and possibly *Terquemia forojuliensis* Boehm from the southern Alps, all of which have been referred to the Cenomanian, though varying opinions have been held as to their exact position in the Cretaceous, the latest reference of *O. joannæ* being to the Turonian and of the Italian form to the Albian or Gault.

The peculiar interlocking chondrophores¹ will serve to distinguish this genus from any described type known to me, making it so distinct that it is difficult to assign it to any of the established families. The superficial resemblance of the shell to *Ostrea* is probably due almost entirely to its similar sedentary habit, and its internal features are too distinct to permit its reference to the same family.

The genus *Terquemia* Tate² (= *Carpenteria* Deslongschamps³ not Gray) is somewhat similar externally, but it is attached by the right valve, has a long, narrow, ligamental groove in each valve, and the rounded muscular scar is deeply impressed, while the pallial line is not visible. This name, *Terquemia*, was proposed for a few species of Liassic shells, was afterwards applied, probably erroneously, to several Triassic species, and still more recently to the above-mentioned Cretaceous form, which I suspect to be based on an imperfectly preserved specimen of *Chondrodonta*.

Some of the internal features of *Hinnites*, especially the pallial line and in thin-shelled specimens the faintly marked muscle scar, are suggestive of *Chondrodonta*. The chondrophore also extends across the hinge plate and projects slightly beyond it into the body cavity, but it is a deep, simple groove in each valve. In the early stages of growth the shell has well-marked ears, and in the right (attached) valve a byssal sinus, neither of which features has been recognized in *Chondrodonta*.

The affinities of *Chondrodonta* seem to be with the superfamily Pectinacea, which includes the Spondylidæ and Limidæ as well as the Pectinidæ. *Terquemia* has usually been referred to the Spondylidæ, but in Zittel's *Grundzüge der Palæontologie*, and also in the English edition of the same work, it is transferred to the Ostreidæ, without good reason, as it seems to me. Judging from figures and descriptions only, I would place it at least in the same superfamily with *Chondrodonta*.

CHONDRODONTA MUNSONI (Hill).

(Plate XXV, figs. 1-5.)

Ostrea munsoni HILL, Proc. Biol. Soc. of Washington, VII, 1893, p. 105, pl. XII.

Hippurites flabellifer CRAGIN (in part), 4th Ann. Rept. Geol. Surv. Texas, 1893, p. 190, pl. XL, fig. 1 (not pl. XXXVIII, fig. 3).

Shell attaining a large size, varying in outline from ovate to elongate-ovate, and irregularly triangular; beaks inconspicuous, slightly deflected laterally, with a variable, usually small, area of

¹ This structure has been observed in eight specimens of *C. munsoni*, five of *C. glabra*, and four of *C. joannæ*.

² Appendix to Woodward's *Manual of the Mollusca*, 1867, p. 65.

³ Mém. Soc. Linn. de Normandie, XI, pp. 127-131, pl. XIX, figs. 2-11.

attachment on the lower valve; attached valve moderately convex, but varying considerably in this respect; upper valve¹ slightly concave, almost conforming to the curvature of the lower valve, so that the space between them is extremely thin; surface of both valves marked by rather fine radiating ribs, about equal in width to the interspaces, and many of them branching one or more times before reaching the margin, or with short ribs interpolated between them; sculpture often equally strong on both valves, but in some cases nearly obsolete on the upper valve; internal features as described for the genus.

Average specimens usually measure from 130 to 150 mm. in length and about 70 to 75 mm. in greatest breadth. One ovate specimen measures 121 mm. in length and 94 mm. in greatest breadth and occasional examples are more nearly circular in outline. One very large triangular specimen collected by Mr. Hill is 166 mm. in length and is expanded in fan-shape toward the base until it is 172 mm. broad. The convexity or thickness of the two valves united is seldom more than 10 mm. and there is little difference in this respect between young and adult shells.

There is a perceptible, though not great, variation in the coarseness of sculpture of different individuals, as may be seen by the illustrations.

The species is associated at most localities with *Radiolites davidsoni* Hill and it is often found attached to that form. This habit led Cragin and other members of the Geological Survey of Texas to suppose that both shells belonged to the same animal which was described as *Hippurites flabellifer*.² The shell is usually attached by one edge of the lower valve near the beak and it often shows a tendency to grow around the supporting object. A curious example of this is seen in the smaller of Hill's figured types (now preserved in the geological department of Johns Hopkins University), which shows a fragment of *Radiolites* shell nearly half an inch long firmly attached in a deep notch that involves both valves of the *Chondrodonta*.

Ostrea joannæ Choffat³ from the Cretaceous of Portugal is very similar to this species in form, sculpture, and all other described characters except that the sculpture is considerably coarser. Through the courtesy of Prof. Paul Choffat I have received a dozen specimens of *O. joannæ* from Monte Serves and Runa, Portugal, since this description was written. Sections were cut across the umbonal region of

¹ Mr. Hill inadvertently described the upper valve as the lower.

² This name has a few weeks' priority over *Ostrea munsoni*, but since it was applied to two entirely distinct forms its designation as *Hippurites* necessitates its restriction to the Rudistid portion of the complex species.

³ Recueil d'études paléontologiques sur la faune Cretacique du Portugal, I, p. 34, Ostreidae, pl. I, figs. 1-7, and pl. II, figs. 8-19. Lisbon, 1886.

several specimens, and in at least four these show essentially the same hinge structure as *O. munsoni*. I do not consider the Portuguese and Texan forms specifically identical, however, as Professor Choffat¹ has done, though they are certainly congeneric. The sculpture is much coarser in *O. joannæ* and the ribs are much more angular even when they are not larger. Choffat at first referred the horizon of *O. joannæ* to the Cenomanian, but in later papers he treats it as Turonian.

G. Boehm² has figured a form from the Venetian Alps as *Ostrea aff. munsoni* that still more closely resembles the Texan species in external features. Associated with it are some smaller shells that Boehm has described as *Terquemia forojuliensis*,³ figuring the interior of a worn specimen. This figure is such as might be drawn with a few slight errors in restoration from an imperfectly preserved attached valve of *Chondrodonta munsoni*, and it is very probable that the types of *Terquemia forojuliensis* are young specimens of the *Ostrea aff. munsoni*, and that they all belong to *Chondrodonta*. From the same region Futterer has described *Pinna ostreæformis*,⁴ which, according to Boehm, is identical with his *Ostrea aff. munsoni*, and more recently Schnarrenberger⁵ has identified probably the same form as *Ostrea munsoni*. These Italian fossils also have been referred to the upper Cenomanian by Boehm, though the beds containing them have at different times been referred to horizons as widely separated as the Urgonian and the Turonian. Schnarrenberger considers them older than the Cenomanian. In Choffat's latest paper, above cited, *O. munsoni* Hill, *O. aff. munsoni* Boehm, and *Pinna ostreæformis* Futterer, are all treated as synonyms of *O. joannæ*, and the Portuguese beds in which the species occurs are placed in the middle Turonian.

A note by Virgilio⁶ treating of the group of *Ostrea joannæ*, to which Professor Choffat kindly referred me, has not yet reached Washington, and so could not be consulted.

A few other forms, including one from the Nummulitic of Egypt, have been referred to the "group of *Ostrea joannæ*," but as nothing could be learned as to their internal features, they have not been considered. The sculpture alone is not to be depended upon as characteristic of this group. For example, Conrad⁷ figures a form under the

¹ Revue Critique de Paléozoologie, II, 1898, p. 174, and Mon. Strat. système crétacique du Portugal: La Crétacique supérieur au nord du Tage, pp. 183-184, Lisbon, 1900.

² Beiträge zur Kenntniss der Kreide in den Südalpen. I. Die Schiosi- und Calloneghe-Fauna, Palæontographica, XLI, 1894, p. 96, pl. VIII, figs. 1, 2.

³ Idem., figs. 5 and 6.

⁴ Palæont. Abhandl., Dames und Kayser, VI (new series II), 1896, Pt. 2, p. 259.

⁵ Berichte d. Naturforschenden Gesellschaft zu Freiburg i. Br. XI, July, 1901, Pt. 3, p. 196.

⁶ Bolletino della Societa Geologica Italiana, XX, 1901.

⁷ Lynch's Report of the United States Expedition to Explore the Dead Sea and the River Jordan, pl. I, figs. 7 and 8.

name *Ostrea virgata*, which has a lower valve, with sculpture quite similar to that of *C. munsoni*, but examination of the original specimen, now in the museum of Yale University, shows that it is a true *Ostrea* with a smooth upper valve and not at all related to *C. munsoni*.

Localities and position.—Hill's figured types came from Belton, Texas; those discussed by Cragin as part of a supposed *Hippurites*, from Bartons Creek, near Austin, Double Mountain, in Stonewall County, and Big Springs, Howard County; additional specimens in the Texas State collection are labeled "Cooper Mountain, Kent County;" the specimens now figured are from Nolands River at Belton, and from the bed of Bartons Creek, near the stone bridge 2 miles from Austin, where the species is abundant; a few additional specimens are from near Kickapoo Springs, on the west fork of Nueces River, from High Bridge, on Pecos River, and from Bluff Creek, about 25 miles west of Waco, the latter collected by Mr. John K. Prather. The species is confined to the Edwards or "Caprina" limestone, in the Fredericksburg division of the Comanche series. Precise correlation of the horizon with the European section will not now be attempted, but it is certainly much older than the Turonian.

CHONDRODONTA GLABRA, new species.

(Plate XXVI, figs. 1-3.)

Shell rather large, flat, or sometimes variously bent; lower valve gently convex; upper valve concave, closely conforming to the curvature of the attached valve; beaks inconspicuous, submedian, scarcely at all deflected laterally, with a very small area of attachment on the lower valve; surface of both valves smooth with only irregular lines of growth; internal characters as described for the genus, the hinge plate of the lower valve showing also one or two obscure shallow grooves in advance of the chondrophore.

An average specimen measures 117 mm. in length, 68 mm. in greatest breadth, and 10 mm. in convexity of the two valves united. The general habit of the shell is very similar to that of *C. munsoni* and the structure of the hinge is essentially the same. The smooth surface at once separates it from that species. It also appears to be somewhat more regular in form and more nacreous in texture.

Locality and position.—The types (five specimens) were collected by the writer in 1895 at a quarry one mile east of Kerrville, Texas, where the species is abundant, associated with *Monopleura* in a thin band near the middle of the limestone then quarried. The horizon was thought to be the upper part of the Glen Rose, and therefore considerably older than the horizon of *C. munsoni*, though I did not have the opportunity to study the stratigraphy of the neighborhood in detail.

EXPLANATION OF PLATES.

PLATE XXV.

Chondrodonta munsoni (Hill), p. 302.

- Fig. 1. Lower valve of a medium-sized somewhat elongate specimen lacking nearly an inch of the umbonal portion and cut across the lower part of the hinge.
2. View of the upper end of specimen represented by fig. 1, polished to show transverse section of the two valves and their chondrophores.
3. A similar section across the lower part of the hinge of the same specimen at the cut shown in fig. 1.
- 4, 5. Opposite views of a small specimen showing sculpture of the same strength on both valves.
- (The specimen represented by figs. 1-3 has the upper valve nearly smooth.)

PLATE XXVI.

Chondrodonta glabra, new species, p. 305.

- Fig. 1. Exterior of a small attached valve. (The striations on the lower portion are accidental, due to slight slipping movements of the rocks.)
2. Interior of same, showing the hinge and the pallial line; *pp*, pallial impression; *cl*, chondrophore of lower valve; *cu*, broken edge of chondrophore of the upper valve still adhering in the groove of the lower valve. At its broken distal extremity it may be seen curving under the other chondrophore.
3. Cross section of lower part of the hinge of a larger specimen.



CHRONDRODONTA MUNSONI (HILL).

FOR EXPLANATION OF PLATE SEE PAGE 307.



CHONDRODONTA GLABRA STANTON.

FOR EXPLANATION OF PLATE SEE PAGE 307.

CATALOGUE OF A COLLECTION OF HUMMINGBIRDS FROM ECUADOR AND COLOMBIA.

By HARRY C. OBERHOLSER,
Assistant Ornithologist, Department of Agriculture.

The collection of hummingbirds gathered by Messrs. Claud Hamilton and Walter Goodfellow during their trip to Ecuador and Colombia, in 1898 and 1899, came finally, by purchase, into possession of the United States National Museum. With the possible exception of that brought together by Baron,¹ it is probably the finest single collection ever made, comprising, as it does, 1,136 specimens, almost all in fine condition of plumage, and accompanied by proper data. Although some of them came from Colombia, by far the greater number were collected in Ecuador. One hundred and nine species and subspecies are represented, including, besides several hitherto undescribed, such rare and otherwise interesting forms as *Topaza pyra*, *Phaiolaima cervinigularis*, *Colibri buckleyi*, *Helianthea lutetiae hamiltoni*, and *Eutoxeres baroni*.

Under many species of the subjoined list there are added in smaller type the field notes of the collectors, which Mr. Goodfellow has kindly furnished for this purpose. As he has recently published an account of the expedition's itinerary and a description of the region traversed,² these need not be inserted here. Additional information regarding the altitude of some of the places at which the humming-birds were taken has been supplied by Mr. Goodfellow, and is given below as of possible interest:

Western Ecuador:	Feet.	Western Ecuador—Continued.	Feet.
Aloag.....	7,800	Intag.....	5,000
Guallabamba.....	6,500	Central Tableland:	
Ibarra.....	6,800	Puembo, Chillo Valley.....	7,500
Mindo.....	7,000	Pifo, Chillo Valley.....	7,800
Chota Valley.....	4,250	Guápalo, Chillo Valley.....	8,080
Canzacota.....	6,100	Quito.....	10,000
Milligalli.....	6,600	Eastern Ecuador:	
Santo Domingo.....	600	Papallacta.....	11,500
Nanegal.....	1,000	Báeza.....	5,900
Guala.....	6,000		

¹ Hartert, Novitates Zoologicae, I, 1894, pp. 43-64.

² Ibis, April, 1901, pp. 300-309.

The writer here takes occasion to thank the authorities of the American Museum of Natural History for the loan of material necessary for comparison in the preparation of this paper. He is, as well, under great obligation to Mr. Robert Ridgway and Dr. Charles W. Richmond for various courtesies.

The systematic sequence of the following list is that of Mr. Hartert, in the Tierreich, which seems to be by far the best arrangement yet proposed. All measurements in this paper are in millimeters.

DORYFERA JOHANNAE (Bourcier).

Trochilus johannae BOURCIER, Proc. Zool. Soc. Lond., 1847, p. 45.

Dorifera johannae BONAPARTE, Conspectus Avium, I, 1850, p. 68.

Two specimens—male and female—from Archidona, east Ecuador, April, 1899. They appear not to differ from Colombian specimens.

A pair shot in the depths of the forests on our way down to the Napo, a day's walk above the village of Archidona. They had a very loud, sharp call note.

DORYFERA LUDOVICIAE RECTIROSTRIS (Gould).

Doryfera rectirostris GOULD, Introd. Troch., 1861, p. 71.

Doryfera ludoviciae rectirostris HARTERT, Tierreich, IX, 1900, p. 11.

Nine specimens, all but one from Milligalli, west Ecuador. A single male from Baeza, east Ecuador, does not differ from the others. The females closely resemble the males, but lack the glittering green forehead. Aside from the greater length of bill this form differs from true *ludoviciae* in its much longer wing and tail, characters not commonly mentioned.

I was told that at one time these birds used to be met with regularly at Milligalli, but now they are only occasionally seen there. Local name, "Viudas"—widows.

THRENETES CERVINICAUDUS Gould.

Threnetes cervinicauda GOULD, Proc. Zool. Soc. Lond., 1854, p. 109.

Two adult males from Napo village, east Ecuador, are apparently not different from Colombian specimens.

THRENETES FRASERI (Gould).

Glaucis fraseri GOULD, Mon. Troch., I, 1861, pl. xii.

Threnetes fraseri BOUCARD, Humming Bird, I, 1892, p. 17.

Four specimens, from Santo Domingo, west Ecuador. Although most closely allied to *Threnetes ruckeri*, the present species is yet quite distinct, and in any plumage can be readily identified. An additional character separating it from *T. ruckeri* is the darker, less golden shade of the upper parts. Immature birds have the feathers of the upper surface narrowly margined with buffy or grayish white. There seems to be no difference between the sexes.

They frequent the depths of the forests around Santo Domingo, where they feed on the red flowers of a parasitical plant growing high up on the tree trunks. Consequently it was always necessary to use a gun to shoot these birds.

GLAUCIS HIRSUTA AFFINIS (Lawrence).

Glaucis affinis LAWRENCE, Ann. N. Y. Lyc. Nat. Hist., VI, 1858, p. 261.

One adult male, from Napo village, east Ecuador.

Although in color *Glaucis hirsuta* varies so much individually that it seems impossible to make out any geographical forms, there is yet such a great difference in size between specimens from eastern Brazil and those from Costa Rica that at least two subspecies may easily be recognized. Birds from eastern Brazil, Trinidad, Tobago, and Grenada agree in being of very large size; while those from Nicaragua and Costa Rica are the smallest. A single individual from Peru, and the above-mentioned one from Ecuador are practically identical with those from Costa Rica. A series of specimens from central and northern Colombia seems to show intermediate tendencies, though much nearer this than to the typical form from eastern Brazil.

The original description of *Glaucis hirsuta*¹ was based undoubtedly upon the Brazilian bird, so that the form ranging from Grenada to southeastern Brazil must be called *Glaucis hirsuta hirsuta*. For the western race, occurring from Nicaragua to Peru, the earliest available name appears to be *Glaucis affinis* Lawrence,² based on the bird from Ecuador, and it should therefore now stand as *Glaucis hirsuta affinis*. The bird described by Boucard as *Glaucis columbiana*,³ from the Rio Dagua, Colombia, is undoubtedly the same, as may easily be seen by reference to his original description. No importance can be attached to the uniform rich cinnamon color of the lower surface in his specimens, for such a condition of plumage occurs by no means infrequently throughout the range of *Glaucis hirsuta*.

The difference between the two races is sufficiently emphasized by the following measurements:

Name.	Sex.	Locality.	Wing.	Tail.	Exposed culmen.
<i>Glaucis hirsuta hirsuta</i>	Male ?..	Bahia, Brazil.....	66	41.0	30.5
Do.....	Male ?..	do.....	65	41.0	30.0
<i>Glaucis hirsuta affinis</i>	Male ..	Escondido River, Nicaragua.....	53	33.0	28.0
Do.....	Male ..	Napo village, Ecuador.....	53	32.5	30.0

The sole specimen of this species was shot under the eaves of an Indian hut at a village near the headwaters of the Napo, where it was searching for insects.

¹ *Trochilus hirsutus* Gmelin, Syst. Nat., I, 1788, p. 490.

² Ann. N. Y. Lyc. Nat. Hist., VI, 1858, p. 261.

³ Genera Hummingbirds, 1895, p. 402.

PHOETHORNIS YARUQUI (Bourcier).

Trochilus yaruqui BOURCIER, Compt. Rend. Ac. Sci., XXXII, 1851, p. 187.

Phaethornis yaruqui GOULD, Mon. Troch., I, 1852, pl. xxvii.

Four specimens, from Santo Domingo, west Ecuador. The female of this species is somewhat smaller than the male, though apparently almost identical in color. According to the collector's notes upon the labels of these examples the mandible in both sexes is *crimson* in life.

PHOETHORNIS LONGIROSTRIS BARONI (Hartert).

Phaethornis baroni HARTERT, Ibis, 1897, p. 426.

A single specimen from Santo Domingo, west Ecuador, belongs apparently to this form. It is similar to *Phoethornis longirostris longirostris*, but much smaller; the upper surface is green, with very much less of bronzy tinge; the ochraceous of rump and upper tail-coverts much paler; the lower parts much less ochraceous, the crissum almost white; the tips of rectrices grayish white instead of ochraceous. It may be described as follows:

Top of head dull brown; cervix the same, with greenish gloss, the feathers margined with ochraceous; back and rump metallic grass green, the feathers of the former narrowly, of the latter broadly edged with buffy and ochraceous; upper tail-coverts ochraceous buff, more or less barred with dusky green; wings sepia, with a purplish sheen. the superior coverts green like the back; tail greenish on basal portion, terminally brownish black, broadly tipped with white, this last on the long central feathers amounting to much more than a third of their total length; superciliary and loreal stripes deep buff; auriculars brownish black; throat and breast dull grayish, with a wash of ochraceous; a central gular and the rectal stripes buffy white; abdomen and crissum buffy white.

Phoethornis longirostris baroni is very different from typical *longirostris*, taking birds from Honduras as such, and, in fact, is nearer to *Phoethornis longirostris mexicanus* (Hartert). From the latter it may be distinguished by its decidedly smaller size (*mexicanus* is somewhat larger than the true *longirostris*), less bronzy upper parts, and the very much less ochraceous lower surface. Specimens from Panama are, in size and color, somewhat intermediate between *longirostris* and *baroni*, though certainly referable to the former.

The following measurements exhibit the differences of size between *Phoethornis longirostris longirostris* and *P. longirostris baroni*:

Name.	Sex.	Locality.	Wing.	Tail.	Exposed culmen.
<i>Phoethornis l. longirostris</i>	Male ...	Santa Ana, Honduras	63	67	43
Do	Male ...	do	64	72	42
<i>Phoethornis l. baroni</i>	Male ...	Santo Domingo, Ecuador.....	58	63	41

There are apparently five recognizable races of this species, namely:

Phoebastria longirostris longirostris (DELAFFRE).—Guatemala to Colombia.

Phoebastria longirostris mexicanus (HARTERT).—Southern Mexico.

Phoebastria longirostris susurrus BANGS.—Santa Marta, Colombia.

Phoebastria longirostris baroni (HARTERT).—Western Ecuador.

Phoebastria longirostris bolivianus (GOULD).—Bolivia and Peru.

PHOEBASTRIA HISPIDUS (Gould).

Trochilus (—?) *hispidus* GOULD, Proc. Zool. Soc. Lond., 1846, p. 90.

Phaethornis hispidus BONAPARTE, Consp. Avium, I, 1850, p. 68.

The one adult male from Archidona, east Ecuador, apparently does not differ materially from Colombian specimens.

All the specimens we procured of these three species (*Phoebastria yaruqui*, *P. longirostris*, and *P. hispidus*) were shot in the gloomier parts of the forests among the undergrowth, and all had the same peculiar way of hovering at times in front of one's face or close to the barrel of the gun, a peculiarity which I never once observed in any of the hummingbirds found out in the open. *P. longirostris* and *P. yaruqui* are confined solely to the western forests, and *P. hispidus* to the eastern side.

PHOEBASTRIA SYRMATOPHORUS BERLEPSCHI (Hartert).

Phaethornis berlepschi HARTERT, Nov. Zool., I, 1894, p. 56.

A single example from Milligalli, west Ecuador, seems to be typical of *berlepschi*, which evidently represents true *syrmatophorus* on the west side of the Andes. Apparently typical specimens of *berlepschi* from Quito are in the collection of the National Museum.

The single specimen was shot whilst hovering over a bush on the river bank. I was told that these birds used to be very plentiful in this locality, but of recent years they have almost entirely disappeared.

PHOEBASTRIA GRISEOGULARIS Gould.

Phaethornis griseogularis GOULD, Proc. Zool. Soc. Lond., 1851, p. 115.

Three specimens, from Archidona, east Ecuador. While the best character separating this species from *P. striigularis* seems to be the color of the tail, yet the deep, almost uniform rufous of the lower surface will almost, if not quite, always serve to distinguish the present bird.

Confined to the eastern forests, and we did not once see them in the open. They have much the habits of *Phoebastria*.

PHOEBASTRIA STRIIGULARIS ATRIMENTALIS (Lawrence).

Phaethornis atrimentalis LAWRENCE, Ann. N. Y. Lyc. Nat. Hist., VI, 1858, p. 260.

Two specimens, from Milligalli, west Ecuador. These differ from Colombian birds in being brighter, more rufescent below, and in having the chin together with the upper throat less conspicuously streaked with dusky. These differences appear to be sufficient for the recognition of the Ecuador bird as a geographical race. The type of

striigularis came from Bogota,¹ as did also the type of *amaura*,² leaving *atrimentalis*,³ based on a specimen from between Quito and the headwaters of the Rio Napo, as the proper name for the present form.

Was met with only on the western side, but at a much higher altitude (6,000 feet) than *P. griscogularis* on the eastern side, and, unlike the latter bird, frequented the clearings. Both species continually uttered a sharp call note, remarkably loud for the size of the bird.

EUTOXERES CONDAMINI (Bourcier).

Trochilus condamini BOURCIER, Compt. Rend. Ac. Sci., XXXII, 1851, p. 187.

Eutoxeres condaminii GOULD, Mon. Troch., I, 1851, pl. iv.

Two specimens, from Archidona, east Ecuador.

This very distinct species is confined solely to the forests at the foot of the eastern side of the eastern Andes, but seemed to be rare, as we saw only the two specimens procured. Its habits resemble those of the following species [*Eutoxeres aquila heterura* and *Eutoxeres baroni*] and, like them, feeds on the wild plantain flowers.

EUTOXERES AQUILA HETERURA (Gould).

Eutoxeres heterura GOULD, Ann. and Mag. Nat. Hist., I, 1868, p. 456.

Eutoxeres aquila heterurus TACZANOWSKI and BERLEPSCH, Proc. Zool. Soc. Lond., 1885, p. 102.

Sixteen specimens, all from Santo Domingo, west Ecuador. These exhibit, with comparatively little variation, the characters of *heterura*. The females, though in color practically identical with the males, are in size somewhat less. In immature birds the feathers of the upper surface have narrow dull buffy edgings.

At Santo Domingo, on the western side of the western Andes, we found these birds plentiful during the month of October. They live among the thick undergrowth of the hot forests, are never seen out in the open, and feed on the flowers of the wild plantain, their curved bills exactly fitting the shape of the flowers. Their stomachs always contained many small insects. In their dark haunts, where little light penetrated, they were difficult birds to see, as they have a rapid, jerky flight. It was often only the loud humming noise made by their wings that betrayed their presence. Sometimes they would hover for some seconds within two feet of one's face or an inch or two from the end of the gun or blowpipe, and then suddenly dart off again. Once I caught in a butterfly net one hovering thus.

The localities Quito and Sarayacu, on the labels of the British Museum catalogue, are quite erroneous. The base of the lower mandible is very yellow in life. Local name, "Pico curvo."

EUTOXERES BARONI E and Cl. Hartert.

Eutoxeres baroni ERNST and CL. HARTERT, Nov. Zool., I, 1894, p. 54.

A single specimen, from Santo Domingo, west Ecuador, is referred to this species. Though closely allied to *Eutoxeres a. heterura*, *E. baroni* is apparently distinct. This example exhibits the characters

¹ Gould, Mon. Troch., I, 1854, pl. xxxvii.

² Bourcier, Rev. et Mag. Zool., 1856, p. 552.

³ Lawrence, Ann. N. Y. Lyc. Nat. Hist., VI, 1858, p. 260.

assigned by Hartert in his original description, the small white tips to the tail feathers readily distinguishing it from allied forms. Judging by the present specimen, *E. baroni* is decidedly larger than *E. a. heterura*.

CAMPYLOPTERUS OBSCURUS Gould.

Campylopterus obscurus GOULD, Proc. Zool. Soc. Lond., 1848, p. 13.

Two specimens, from Baeza and Archidona village, east Ecuador, respectively. The female is like the male in color, but has a shorter wing and tail, with a *longer* bill. Both of these are apparently identical with an example from Peru.

This is a forest haunting species, and the pair obtained were shot whilst feeding on the flowers of an orchid.

CAMPYLOPTERUS LAZULUS (Vieillot).

Trochilus lazulus VIEILLOT, Tabl. Encyc. Méth., II, 1822, p. 557.

Campylopterus lazulus BONAPARTE, Consp. Avium., I, 1850, p. 71.

Nine specimens, from Baeza and Archidona, east Ecuador. These apparently do not differ from Colombian birds. The color of the throat varies considerably, ranging from violet to almost pure blue.

Found on only the eastern side of the eastern Andes, and most of our specimens were shot while feeding on the flowers of the tobacco plants growing around the huts at Baeza. The iris was distinctly dark red in the males, but a young male and a female shot above Archidona both had the irises black. Local name, "Ala hueso"—bone wing.

CAMPYLOPTERUS VILLAVISCENSIO (Bourcier).

Trochilus villaviscensio BOURCIER, Compt. Rend. Ac. Sci., XXXII, 1851, p. 187.

Campylopterus villaviscensio GOULD, Mon. Troch., II, 1859, pl. XLVII.

One adult male, from Baeza, east Ecuador.

The single specimen of this species was shot around the tobacco plants at Baeza.

FLORISUGA MELLIVORA (Linnæus.)

Trochilus mellivorus LINNÆUS, Syst. Nat., I, 1758, p. 121.

Florisuga mellivorus BONAPARTE, Consp. Avium., I, 1850, p. 73.

Two specimens, from the vicinity of Baeza, east Ecuador. One of these is an immature male with the center of the throat blue. This species is very constant throughout its range, for there seems to be scarcely any difference between birds from Guatemala, Ecuador, and Trinidad.

PATAGONA GIGAS (Vieillot).

Trochilus gigas VIEILLOT, Gal. Ois., I, 1825, p. 296, pl. CLXXX.

Patagona gigas BONAPARTE, Consp. Avium., I, 1850, p. 75.

Six specimens from Guapalo and elsewhere in the valley of Chillo, near Quito, and from the road between there and Papallacta, Ecuador. This extends the range of the species to northern Ecuador, as Riobamba seems to be the northernmost previous record.

There seems to be considerable variation in the color of *Patagona gigas* that is not satisfactorily ascribable to sex or age. The lower surface in the present examples ranges from a dull mottled brown to an almost uniform chestnut-rufous.

They feed on the flowers of the giant aloes. Local name, "Quinde golondrina"—the swallow humming bird. They are occasionally seen in the gardens of Quito.

AGYRTIA VIRIDICEPS (Gould).

Thaumatias viridiceps GOULD, Proc. Zool. Soc. Lond., 1860, p. 307.

Agyrtia viridiceps HEINE, Journ. f. Orn., 1863, p. 185.

Seven specimens from Santo Domingo, west Ecuador. The females appear to have the crown and forehead noticeably duller than the males, and possess, furthermore, a distinct blackish subterminal bar on the tail-feathers. This latter is, however, sometimes indicated in the males.

AGYRTIA FLUVIATILIS (Gould).

Thaumatias fluvialis GOULD, Introd. Troch., 1861, p. 154.

Agyrtia fluvialis HEINE, Journ. f. Orn., 1863, p. 184.

One apparently typical adult male, from Archidona village, east Ecuador.

AGYRTIA AMABILIS (Gould).

Trochilus (—?) *amabilis* GOULD, Proc. Zool. Soc. Lond., 1851, p. 115.

Agyrtia amabilis HARTERT, Tierreich, IX, 1900, p. 48.

Five specimens from near Guayaquil, Ecuador. Careful comparison with a series from Central America and Colombia fails to reveal any essential difference. It seems impossible to find any structural characters to separate *Polyerata* from *Agyrtia*.

LEPIDOPYGA GOUDOTI (Bourcier).

Trochilus goudoti BOURCIER, Rev. Zool., 1843, p. 100.

Lepidopyga goudoti SIMON, Cat. Troch., 1897, p. 12.

The one specimen of this species in the collection was taken by Mr. Goodfellow from an Indian necklace at Santo Domingo, Ecuador; but the make of the skin strongly suggests the probability that it originally came from the neighborhood of Bogotá, Colombia. The fact that the species has never been recorded from Ecuador serves to strengthen this opinion.

Personally we never recognized any of these birds alive, and this single specimen I found a Colorado Indian woman wearing on her necklace at Santo Domingo. I was told it had been shot in that neighborhood.

SAUCEROTTIA EDWARD (Delattre and Bourcier).

Trochilus edward DELATTRE and BOURCIER, Rev. Zool., 1846, p. 308.

Saucerottia edwardi SCLATER and SALVIN, Proc. Zool. Soc. Lond., 1864, p. 365.

Two specimens from Santo Domingo, west Ecuador, add the species

to the fauna of Ecuador, thus extending its range more than 500 miles. A careful comparison of these Ecuador birds with a series from Panama fails to reveal any tangible difference.

AMIZILIS TZACATL JUCUNDA (Heine).

Eranna jucunda HEINE, Journ. für Orn., 1863, p. 188.

Amazilia tzacatl jucunda HARTERT, Tierreich, IX, 1900, p. 229.

Three specimens from Santo Domingo, west Ecuador, apparently typical of this race.

Generally seen feeding with *A. dumerilii*.

AMIZILIS DUMERILII (Lesson).

Ornismya dumerilii LESSON, Hist. Nat. Colibris, suppl., p. 172, pl. xxxvi.

Amizilis dumerili OBERHOLSER, Proc. Acad. Nat. Sci. Phila., 1899, p. 207.

Fourteen specimens from Santo Domingo, west Ecuador. These seem to be identical with examples from Puna Island and Guayaquil. There is considerable variation, aside from that ascribable to sex, in the extent and shade of the rufous on the lower parts.

Found feeding in the small clearing of Santo Domingo, western Ecuador, on the low bushes and plants.

HYLOCHARIS GRAYI (Delattre and Bourcier).

Trochilus grayi DELATTRE and BOURCIER, Rev. Zool., 1846, p. 307.

Hylocharis grayi BONAPARTE, Consp. Avium, I, 1850, p. 74.

Twenty specimens, from Chota Valley; La Juna, above Chota Valley, north Ecuador; and Patia Valley, southern Colombia.

The Chota Valley, where we obtained most of our specimens, is a hot, sandy, burnt-up valley in the north of Ecuador, with precipitous sides covered in parts with thorny bushes and acacias which during our visit were devoid of all trace of green; and it was a wonder what these birds could possibly find to feed on there. In life the bill is almost wholly pale flesh color, and on two occasions when I saw them copulating the bill of the male became a diffused blood color. In Quito they are called "Chotas," but they are not found nearer to that city than the Chota Valley.

Mr. Hartert is apparently right in uniting *Eucephala* and *Hylocharis*, for structurally they can not be distinguished.

CHRYSURONIA OENONE OENONE (Lesson).

Ornismya oenone LESSON, Hist. Nat. Colibris, suppl., 1832, p. 157, pl. xxx.

Chrysuroxia oenone BONAPARTE, Consp. Avium, I, 1850, p. 75.

Ten specimens, from Archidona, Baeza, and Rio Napo, east Ecuador. These are typical of true *oenone*, as is shown by comparison with birds from Trinidad and Colombia.

DAMOPHILA JULIE FELICIANA (Lesson).

Ornismya felicianae LESSON, Rev. Zool., 1844, p. 433.

Damophila julie felicianae HARTERT, Novit. Zool., V, 1898, p. 494.

Fifteen specimens, from Santo Domingo, and near Guayaquil, west Ecuador. The only difference between the present form and true *Damophila julie* seems to be the longer bill of the former.

CHLOROSTILBON MELANORHYNCHUS Gould.

Chlorostilbon melanorhynchus GOULD, Proc. Zool. Soc. Lond., 1860, p. 308.

Twenty-four specimens, all males, from Jombaco and Chillo Valley, Ecuador. They seem to be identical with birds from Colombia, and in color exhibit a comparatively small amount of individual variation.

A large series of males from the Chillo Valley, near Quito, where a great influx of them took place about January. We were unable to secure even one female. They feed on the guava flowers, and also on flowering acacias. Local name, "Verdes."

CHLOROSTILBON PUMILUS Gould.

Chlorostilbon pumilus GOULD, Ann. and Mag. Nat. Hist., IX, 1872, p. 195.

A single female from near Guayaquil, Ecuador, is apparently referable to this species. It differs from the same sex of *Chlorostilbon melanorhynchus* in its decidedly smaller size, but is practically indistinguishable in color.

CHLOROSTILBON PRASINUS DAPHNE (Gould).

Chlorostilbon daphne GOULD, Introd. Troch., 1861, p. 177.

Chlorostilbon prasinus daphne HARTERT, Tierreich, IX, 1900, p. 77.

Seven adult males from Archidona, east Ecuador. All are in perfect plumage and bear out the subspecific characters assigned by Hartert.¹

From Archidona, at the foot of the eastern Andes, near the headwaters of the Napo. Seen only in the evenings around the orange trees.

CHLOROSTILBON STENURUS (Cabanis and Heine).

Panychlora stenura CABANIS and HEINE, Mus. Hein., III, 1860, p. 50.

Chlorostilbon stenura Mulsant and Verreaux, Mém. Soc. Imp. Sci. Nat. Cherbourg, XII, 1866, p. 186.

Two adult females from Baeza, east Ecuador, belong apparently to this species.

THALURANIA HYPOCHLORA Gould.

Thalaurania hypochlora GOULD, Proc. Zool. Soc. Lond., 1870, pp. 803, 804.

Five specimens, all males, from Gualea, west Ecuador. In some of these the green of the sides of the body has a noticeable bluish tinge.

¹ Tierreich, IX, 1900, p. 77.

THALURANIA FANNYI (Delattre and Bourcier).

Trochilus fannyi DELATTRE and BOURCIER, Rev. Zool., 1846, p. 310.

Thalurania fannyi BONAPARTE, Rev. Zool., 1854, p. 254.

Eleven specimens, from Nanegal, Gualea, and Milligalli, west Ecuador. There is considerable difference in the shade of the abdomen in the different adult males, this ranging from a rich violet purple to deep blue with but a slight tinge of violet. The four adult females are of unusual interest, for they prove beyond much doubt that the female of this species is, as supposed by Salvin,¹ quite different from the same sex of *Thalurania eriphile* in having the abdomen dull brownish slate color glossed with metallic green, instead of being like the rest of the under surface, dull grayish white. Mr. Hartert's opinion² that this represents the plumage of only the young male seems not to be correct, as a young male in the present collection is apparently not distinguishable from the adult females.

THALURANIA NIGROFASCIATA (Gould).

Trochilus (—?) *nigrofasciata* GOULD, Proc. Zool. Soc. Lond., 1846, p. 89.

Thalurania nigrofasciata GOULD, Proc. Zool. Soc. Lond., 1852, p. 8.

Three specimens, from Archidona, east Ecuador, April, 1899, seem not separable from Colombian examples.

COLIBRI DELPHINAE (Lesson).

Ornismya delphinae LESSON, Rev. Zool., 1839, p. 44.

Colibri delphinae BONAPARTE, Consp. Avium, I, 1850, p. 69.

Five specimens, from Mindo and Gualea, west Ecuador. These apparently differ in no essential respect from either Guatemala or Guiana examples.

COLIBRI CYANOTUS (Bourcier and Mulsant).

Trochilus cyanotus BOURCIER and MULSANT, Ann. Sc. Phys. et Nat. Lyon, VI, 1843, p. 41.

Colibri cyanotis BONAPARTE, Consp. Avium, I, 1850, p. 69.

Three examples, from Baeza, east Ecuador. Seemingly identical with birds from Venezuela, the type locality; but evidently not fully adult, as there are traces of ochraceous edging to some of the feathers, and the lower tail-coverts are largely ochraceous. The kinship of this species to *Colibri thalassinus* of Mexico and Guatemala is evidenced by the strongly bluish tinge of the central abdomen in the Costa Rican race, *Colibri cyanotus cabanidis* (Heine), but this does not appear to bridge the gap between *thalassinus* and *cyanotus* sufficiently to render a trinomial necessary for the latter.

¹ Cat. Birds Brit. Mus., XVI, 1892, p. 82.

² Tierreich, IX, 1900, p. 85.

COLIBRI IOLATUS (Gould).

Petasophora iolata GOULD, Proc. Zool. Soc. Lond., 1847, p. 9.

Colibri iolata BONAPARTE, Consp. Avium, I, 1850, p. 69.

Colibri iolatus HARTERT, Tierreich, IX, 1900, p. 94.

Forty-eight specimens, from Chillo Valley, Jambillo, Aloag, Quito, Papallacta, Valle de Viciosa, and Jablon, Ecuador; Pasto, United States of Colombia. Birds of this series from the eastern side of the mountains average more golden green both above and below than those from the western slope, but as this character does not appear to be at all coincident with geographical distribution, it can not be used as the basis for subspecific separation. Examples of both styles of coloration occur in the same localities in Ecuador, Bolivia, and Colombia; and, furthermore, neither is confined to one side of the Andes.

This is another hummingbird very common in Quito and its environs and indeed all over Ecuador, at altitudes of from about 8,500 to 11,500 feet. We found it particularly plentiful in the Chillo Valley when the guava flowers were out. It does not range to so high an altitude on the western Andes as it does on the eastern ranges. I had these birds constantly under observation during our stay at the British consulate in Quito, and they appeared to nest in the courtyards there nearly all the year round. When the nest was destroyed by mice, another one was immediately started elsewhere. They were placed in all sorts of positions, in the creepers by the sides of the doors and windows, and in low trees. One nest was built in a loquat tree and much exposed to the rain. After a few days I noticed the female bird drawing together a few of the large leaves overhead, and securing them in position with cobwebs, which canopy afterwards quite protected her from the rain. These birds would never tolerate the presence of others of even the same species in the garden when nesting, and chased away other birds much larger than themselves. On one occasion they pulled to pieces the nest of a *Diglossa aeterrima* and drove its owners away. They feed largely on small insects, darting into the air and taking them on the wing. The young put their bills right down the throats of the females when feeding. On many occasions the parent birds have flown into the room where I have been skinning birds and seized small pieces of cotton wool from my work table with which to build their nests. They also searched all the corners of the ceiling for spiders. When the first egg is laid, the male bird entirely disappears from the garden and never once comes near it again until the young have flown. On several occasions I saw them copulating in the air, when the male spreads out the blue feathers on the sides of the neck, the only time at which I have seen him do it. The local name is "Quinde real"—royal hummingbird.

COLIBRI BUCKLEYI (Gould).

Pinarolæma buckleyi GOULD, Ann. and Mag. Nat. Hist., V, 1880, p. 489.

Colibri buckleyi HARTERT, Tierreich, IX, 1900, p. 95.

A single specimen from Puembo, Chillo Valley, near Quito, Ecuador, taken in December, 1898. The type of this very interesting species was collected by Buckley at Misqui, Bolivia, and up to the present has remained unique. The example here recorded thus considerably extends the bird's range. This specimen is a male in perfect plumage and is apparently adult. Details of coloration evident in this individual, but not mentioned in descriptions of the type, are the pale

brown terminal band on the tail and the metallic green auriculars; but in other respects it seems to agree with the type.

This bird exactly resembles the only other specimen known, which is in the British Museum collection, and which Gould considered a distinct species and named after its collector. Our specimen was shot in the Chillo Valley near Quito, and was feeding on the aloe flowers in company with *Patagona gigas*.

There appear to be absolutely no structural differences to separate this species generically, and Mr. Hartert has very properly placed it in the genus *Colibri* (= *Petasophora*)¹. Indeed, there are not lacking indications that it may prove eventually to be but a peculiar color phase of *Colibri iolatus* (= *Petasophora iolata*), corresponding to that of the specimen of *Ocreatus melananthus* described hereafter.

ANTHRACOTHORAX VIOLICAUDUS IRIDESCENS (Gould).

Lampornis iridescens GOULD, Introd. Troch., 1861, p. 65.

Six specimens from the vicinity of Nanegal, Ecuador. These are subspecifically distinguishable from true *violicaudus* of northeastern South America, and should bear the name above given. They differ from the typical form by reason of a decided bluish tinge on throat and breast, and also in the usually longer bill.

Confined to the western side, and I believe we obtained all our specimens in the banana plantations at Nanegal, where I frequently saw them hovering among the ragged leaves hanging down the trunks of the banana trees. Local name, "Plataneros negros."

TOPAZA PELLA PAMPREPTA, new subspecies.

Three adult males, all from Suno, on the Rio Napo, east Ecuador. These extend the range of the species a long distance to the westward, and add it to the fauna of Ecuador. They differ from typical *Topaza pella* from British Guiana in the very much greater length of the long tail feathers and in the somewhat shorter wing. There appears to be absolutely no constant difference in color, but the discrepancy in size is so marked that it seems advisable to recognize the Ecuador bird in nomenclature. It may be described as follows:

Type.—Male, adult, No. 174294, U. S. N. M.; Suno, Rio Napo, Ecuador, May, 1899; Goodfellow and Hamilton. Top and sides of head velvety purplish black; cervix and sides of neck rich metallic maroon purple; back shining reddish orange, shading posteriorly into the bright metallic green of the upper tail-coverts; wings fuscus with a purplish gloss, the innermost secondaries chestnut, the superior coverts like the back; tail chestnut, the two middle pairs metallic green, the succeeding pair much elongated, purplish black; throat glittering greenish yellow; jugular band purplish black, continuous

¹ Tierreich, IX, 1900, p. 95.

with that of sides of neck; breast maroon like the cervix, and shading posteriorly into a more reddish shade; crissum shining green; lining of wing chestnut.

The following table of measurements expresses best the difference between the two races of this species:

Name.	Sex.	Locality.	Wing.	Tail (chord of longest feather).	Exposed culmen.
<i>Topaza pella pella</i>	Male	British Guiana	84	92	25
Do	do	do	82	88	24.5
<i>Topaza pella pamprepia</i> ¹	do	Suno, Ecuador	77	122	24.5
Do	do	do	78	108	23

¹ Type.

Frequent in the edges of the forests around the small Indian clearings, and we also observed a few of them along the forest-covered banks of the smaller rivers running into the Napo, but they were by no means common anywhere. Local name, "Urcu-Quinde."

TOPAZA PYRA (Gould).

Trochilus (*Topaza*) *pyra* GOULD, Proc. Zool. Soc. Lond., 1846, p. 85.

Topaza pyra GRAY, Genera Birds I, 1848, p. 110.

One adult male of this magnificent and decidedly uncommon species, from Coca, on the Rio Napo, east Ecuador.

This single specimen was shot at the mouth of the Curarai, the largest tributary of the Napo. They are probably even rarer than *T. pella*, and are, I believe, not found on the upper waters of the Napo.

OREOTROCHILUS CHIMBORAZO (Delattre and Bourcier).

Trochilus chimborazo DELATTRE and BOURCIER, Rev. Zool., 1846, p. 305.

Oreotrochilus chimborazo GOULD, Proc. Zool. Soc. Lond., 1847, p. 10.

Three adult males from the volcano of Chimborazo, west Ecuador.

This species, I believe, is never met with north of Chimborazo. It occurs at altitudes of from 12,000 to 15,000 feet, though according to Hartert, to 17,000 feet, but this must be a mistake, as 16,000 feet is the snow line at the equator in Ecuador, and it is not likely to be found above that. Its local name is "Estrella de Chimborazo."

OREOTROCHILUS JAMESONII Jardine.

Oreotrochilus jamesonii JARDINE, Contr. Orn., 1849, p. 67.

Oreotrochilus chimborazo jamesonii HARTERT, Tierreich IX, 1900, p. 109.

Thirty specimens, from Pichincha, Antisana, and Cotopaxi, Ecuador. There is no apparent difference between the birds from Antisana and Cotopaxi and those from Pichincha. There is in all this splendid series not the slightest indication of intergradation with *O. chimborazo*; therefore we do not follow Hartert¹ in using a trinomial.

Now very much rarer on Pichincha than formerly. They are in fine plumage in December, and during that month in 1898 we found them plentiful near the snow

¹ Tierreich IX, 1900, p. 109.

on the western side of Antisana in the eastern Cordillera, but not on the eastern side of that mountain. They do not remain here all the year round, and some years very few come. Females were remarkably in the minority, this possibly to be accounted for by later arrival or the use of other feeding grounds. Local name, "Pecho blanco"—white chest.

UROCHROA BOUGUERI (Bourcier).

Trochilus bougueri BOURCIER, Compt. Rend. Ac. Sci., XXXII, 1851, p. 186.

Urochroa bougueri GOULD, Mon. Troch., II, 1856, pl. LVII.

Two adult males from near Quito, Ecuador. They were taken in the Guallabamba, which the collectors describe as "a deep, hot ravine north of Quito."

From the rocky ravine of the Guallabamba at about 7,000 feet. They appeared swifter on the wing than any other hummingbird I can remember, and were consequently difficult to shoot, so that a gun had to be used, it being impossible to aim at them with a blowpipe.

CLYTOLAEMA AURESCENS (Gould).

Trochilus (Lampornis) aurescens GOULD, Proc. Zool. Soc. Lond., 1846, p. 88.

Clytolaema aurescens GOULD, Mon. Troch., IV, 1861, pl. CCL.

Two adult males from Napo village, east Ecuador. These are identical with a specimen from Pebas, Peru.

PHAIOLAIMA AEQUATORIALIS Gould.

Phaiolaima aequatorialis GOULD, Mon. Troch., IV, 1860, pl. CCLXIX.

Six specimens from Canzacota, west Ecuador. The female differs from the male in lacking the glittering throat spot, in having the green of the chin much mixed with buffy, and the bend of the wing less reddish. From the female of *Phaiolaima rubinoides*, which the female of the present species closely resembles, it may be separated by the longer bill, usually darker head, and paler under parts. This species is confined apparently to the western side of the Andes. Though closely allied to *rubinoides*, it seems to be a distinct species.

All our specimens were obtained at Canzacota, at 6,500 feet elevation. They are not common, appearing here only periodically, and are called locally "Canzacotas."

PHAIOLAIMA CERVINIGULARIS Salvin.

Phaolæma cervinigularis SALVIN, Cat. Birds Brit. Mus., XVI, 1892, p. 325.

Seven males, from Baeza, and from Cosanga, below Baeza on the road to Archidona—both localities in east Ecuador. These examples are exceedingly interesting, since they determine for the first time the exact habitat of the species. The two type specimens which are now in the British Museum, and which seem to be the only ones hitherto recorded, were without definite locality data, but were supposed by Mr. Salvin to have come from Ecuador. *Phaiolaima cervinigularis* apparently replaces *Phaiolaima aequatorialis* on the eastern side of the

mountains, and, though closely allied to the latter, is apparently distinct. The immature male of *cervinigularis* does not materially differ from the adult, except in the absence of the glittering gular patch. The female is probably like the young male. The present species may be distinguished from *rubinoides* by its somewhat larger size, this most evident in the bill; by the lack of green on the chin and sides of the throat; and by the usually paler under surface. The gular spot has generally a more coppery tinge, but this is not diagnostic. From *aequatorialis*, *cervinigularis* differs in the less extent of the glittering green of the crown, the lack of green on the chin and sides of the throat, and in the almost entire absence of reddish tinge in the color of the bend of the wing.

This is the eastern variety of the western *P. aequatorialis*. Their stomachs contained chiefly insects, but they also feed on the flowers of a tall tree.

HELIODOXA LEADBEATERI (Bourcier and Mulsant.)

Trochilus leadbeateri BOURCIER and MULSANT, Ann. Sc. Phys. et Nat. Lyon, VI, 143, p. 43.

Heliodoxa leadbeateri GOULD Mon. Troch., II, 1860, pl. xcvi.

Two males, one each from Archidona and Baeza, east Ecuador. The status of the Ecuador bird can not be determined by our material. In one of the specimens in this collection the bill is unusually long even for true *leadbeateri*, while in the other it is as short as in *Heliodoxa l. parvula*.

HELIODOXA JACULA JAMERSONI (Bourcier).

Trochilus jamersoni BOURCIER, Compt. Rend. Ac. Sci., XXXII, 1851, p. 187.

Heliodoxa jacula jamesoni HARTERT, Novit. Zool., V, 1898, p. 494.

Nine specimens, from Santo Domingo, west Ecuador. The female of *jamesoni* is distinguishable from that of true *jacula* by its longer bill and by the lack of buffy suffusion on the abdomen, in this latter character resembling *Heliodoxa jacula henryi* of Costa Rica.

In fine plumage at Santo Domingo in October, and were found about the clearings. I took from a guava tree a nest containing 2 eggs belonging to these birds. It was very neat, covered on the outside with flat, pale-gray moss, and lined inside with soft, brown vegetable down resembling vicuña.

IONOLAIMA SCHREIBERSII (Bourcier).

Trochilus schreibersii BOURCIER, Proc. Zool. Soc. Lond., 1847, p. 43 (Loddiges manuscript).

Ionolaima schreibersi GOULD, Mon. Troch., II, 1857, pl. xciii.

Three specimens from Baeza, east Ecuador. One of these, apparently an immature female, has no black on the lower surface, has green instead of blue lower tail-coverts, and green middle tail-feathers.

EUGENIA IMPERATRIX Gould.

Eugenia imperatrix GOULD, Proc. Zool. Soc. Lond., 1855, p. 192.

Ten specimens, from Gualea, west Ecuador. The females are appreciably smaller than the males, and lack the attenuation of the tail.

HELIANTHEA LUTETIAE LUTETIAE (Delattre and Bourcier).

Trochilus lutetiae DELATTRE and BOURCIER, Rev. Zool., 1846, p. 307.

Helianthea lutetiae BONAPARTE, Consp. Avium, I, 1850, p. 74.

Twenty-seven specimens, from Atcatzo, Quito, and Pichincha, Ecuador—chiefly from the last-mentioned locality. Judging from this series, the immature females lack the glittering green forehead, though in other respects they are similar to the adults.

We found these birds exceedingly common on Pichincha in November, December, and January, between 9,000 and 12,000 feet. We never met with them on the eastern Andes. Local name, "Ala blanca"—white wings.

HELIANTHEA LUTETIAE HAMILTONI (Goodfellow).

Helianthea hamiltoni GOODFELLOW, Bull. Brit. Orn. Club, X, 1900, No. LXIX, p. xlviii.

Fifteen specimens, all from Papallacta, east Ecuador.

The males differ from *Helianthea lutetiae lutetiae* chiefly in the more golden shade of the green portions of the plumage, and indicate by their individual variation that *hamiltoni* is but a subspecies of *lutetiae*, which latter it represents on the eastern side of the Andes. The same difference in the hue of the green exists in the females, and an additional character in this sex of *hamiltoni* is the decidedly deeper ochraceous of the throat.

In a communication addressed to the authorities of the United States National Museum, Mr. Goodfellow assured them that the type of *Helianthea hamiltoni* was among the examples of this form transmitted with the rest of the collection. As he failed in the original description to designate the specimen, there has been selected as type the one which corresponds to the measurements given. This is No. 173708, U.S.N.M., and was taken at Papallacta, east Ecuador, in February, 1899.

We met with this species only on the eastern side of the Andes.

HELIANTHEA TORQUATA (Boissonneau).

Ornismia torquata BOISSONNEAU, Rev. Zool., 1840, p. 6.

Bourcieria torquatus BONAPARTE, Consp. Avium, I, 1850, p. 73.

Helianthea torquata HARTERT, Tierreich, IX, 1900, p. 130.

Ten specimens from Baeza, east Ecuador. These apparently do not differ from Bogota examples. Young males, almost like the adults in other respects, still lack the violet crown patch.

Found only on the eastern side of the eastern Andes.

HELIANTHEA FULGIDIGULA (Gould).

Bourcieria fulgidigula GOULD, Mon. Troch., IV, 1854, p. 252.

Helianthea fulgidigula HARTERT, Tierreich, IX, 1900, p. 131.

Twenty-one specimens, from the following localities in western Ecuador: Canzacota; lower west side of Pichincha; lower west side of Corazón; Mindo, west side of Pichincha; and above Milligalli. There is considerable individual variation in the green of the throat, and as well in the metallic crown patch, this latter ranging from violet purple to greenish blue.

Confined to the western side of the western Andes, and were common and in good plumage at Canzacota in September. They frequent the more open parts of the mountain sides, and in the morning were generally seen sitting about sunning themselves. Local name, "Cravata blanca."

HELIANTHEA COELIGENA COLUMBIANA (Elliot).

Lampropygia columbiana ELLIOT, Ibis, 1876, p. 57.

Helianthea coeligena columbiana HARTERT, Tierreich, IX, 1900, p. 132.

Seventeen specimens, all from Baeza, east Ecuador. They seem to be identical with birds from Colombia.

Confined to the eastern side of the eastern Andes, and were common at Baeza in March.

HELIANTHEA WILSONI (Delattre and Bourcier).

Trochilus wilsoni DELATTRE and BOURCIER, Rev. Zool., 1846, p. 305.

Helianthea wilsoni HARTERT, Tierreich, IX, 1900, p. 133.

Seven specimens from Milligalli, west Ecuador. The one immature female is noticeably darker throughout than the adult of the same sex.

Confined to the western Andes.

DIPHOGENA¹ IRIS (Gould).

Helianthea iris GOULD, Proc. Zool. Soc. Lond., 1853, p. 61.

Diphogena iris GOULD, Mon. Troch., IV, 1854, pl. CCXLVII.

This magnificent species is represented in the collection by a single adult male, from the west side of Pichincha, Ecuador.

Lower west side of Pichincha, at about 7,500 feet. They are very rapid flyers and difficult to shoot as they dart in and out among the rocks of the narrow torrents and ravines.

DIPHOGENA HESPERUS Gould.

Diphlogæna hesperus GOULD, Ann. and Mag. Nat. Hist., XV, 1865, p. 129.

Two specimens, from Mindo, west Ecuador. One of these is an immature male and differs from the adult of the same sex in the following particulars, indicating a condition almost adult: The lower parts are duller, owing principally to buffy and rufous edgings, par-

¹ *Diphogena* is the original spelling.

ticularly on the posterior portions; the violet throat spot is wanting; the green of the upper surface is more bronzy; remainder of upper parts much duller, the violet blue of the center of the crown barely indicated, the metallic coppery red of the sides of the crown extending backward over the nape.

LAFRESNAYA SAUL (Delattre and Bourcier).

Trochilus saul DELATTRE and BOURCIER, Rev. Zool., 1846, p. 309.

Lafresnaya saulae BONAPARTE, Consp. Avium, I, 1850, p. 68.

Twenty-four specimens, from Pichincha, Lloa, west side of Corazón, and above Milligalli, west Ecuador; Papallacta, east Ecuador; and Pasto, Colombia. Birds from the east and west sides of the mountains seem to be alike. The single example, an immature female, from Pasto, Colombia, differs from the others in being much more ochraceous below, particularly on the anterior parts, this being fully as conspicuous as in many specimens of *L. lafresnayi*.

We met with them in both ranges of the Andes at elevations of from 10,000 to 12,500 feet, but the greater number of those we obtained were in immature plumage, especially those from the eastern Andes shot in February. At times they are fairly plentiful around the village of Lloa, on Pichincha; and in Quito they are called "Pico curvo de Lloa."

ENSIFERA ENSIFERA SCHLIEPHACKEI (Heine).

Docimastes schliephackei HEINE, Journ. f. Orn., 1863, p. 215.

Docimastes ensiferus schliephackei BERLEPSCH and TACZANOWSKI, Proc. Zool. Soc., Lond., 1884, p. 304.

Thirty-seven specimens, from Papallacta, on the east side of the Andes, and Pichincha, west Ecuador. There seems to be no difference between the birds from the two sides of the mountains, but, judging from the present series, the Ecuador form of *E. ensifera* is worthy of subspecific recognition. The distinction lies apparently in the bill alone, which in the Ecuador form averages much longer than in true *ensifera*. With regard to the constancy of this character, it may be said that out of the present series there are but ten having the bill not longer than the *longest billed* example from a series of Colombian specimens. Thus, though this difference can not be regarded as absolute, it is so decided and obtains in so large a majority of the specimens that it is fully as worthy of recognition as similar differences in other cases which pass unchallenged.

Feed on the flowers of the long *Datura*. The bills of the females average longer than those of the males. They frequent both ranges of the Andes, but personally we met with them only on the eastern sides of the two ranges, at altitudes between 9,000 and 11,500 feet. Local name, "Pico largo."

PTEROPHANES TEMMINCKII (Boissonneau).

Ornismya temminckii BOISSONNEAU, Rev. Zool., 1839, p. 354.

Pterophanes temmincki GOULD, Mon. Troch., III, 1849, pl. CLXXVIII.

Seventeen specimens, from Pichincha and Corazón, Ecuador. This fine series has been carefully compared with birds from Colombia, but they seem not to differ. Two immature males are like the adults save for a rather more golden cast to the plumage, together with the lack of steel blue on the primaries and the presence of rufous edgings on the feathers of throat and abdomen.

At elevations of from 11,500 to 13,000 feet on Corazón and Pichincha, west Ecuador. Local name, "Gruesos."

AGLAEACTIS CUPRIPENNIS AEQUATORIALIS (Cabanis and Heine).

Aglæactis aequatorialis CABANIS and HEINE, Mus. Hein., III, 1860, p. 70.

Aglæactis cupripennis var. *aequatorialis* Mulsant and Verreaux, Mém. Soc. Imp. Sci. Nat. de Cherbourg, XII, 1866, p. 210.

Twenty-six specimens, from the following localities in Ecuador: Papallacta, Padregal, Corazón, Pichincha, and Mojanda. The separation of *aequatorialis* from true *cupripennis* is based on very slight characters, and if the former stands at all it must be on *average* slightly greater size, more blackish chin, and darker under surface. Birds from the eastern side of the mountains in Ecuador are paler below than those from the west side, and in this respect scarcely distinguishable from true *cupripennis*, but altogether they seem to be nearer *aequatorialis*.

Met with in all parts of Ecuador at high altitudes, generally seen singly and perched on the summit of bushes uttering a mournful and monotonous note. Local name, "Quinde café"—coffee-colored humming bird.

BOISSONNEAUA MATTHEWSII (Bourcier).

Trochilus matthewsii BOURCIER, Proc. Zool. Soc. Lond., 1847, p. 43 (Loddiges manuscript).

Boissonneaua matthewsii REICHENBACH, Troch. Enum., 1855, p. 8, pl. DCCLXXXVII.

Fifteen specimens, from Baeza, east Ecuador. Immature birds of both sexes have the middle of the lower surface chestnut, this color apparently spreading irregularly as the individual advances toward maturity.

Met with only at Baeza, on the eastern side, where they were fairly plentiful in March, but not in very good plumage. Local name, "Pecho café."

BOISSONNEAUA JARDINI (Bourcier).

Trochilus jardini BOURCIER, Compt. Rend. Ac. Sci., XXXII, 1851, p. 187.

Boissonneauxia jardinei SIMON, Cat. Troch., 1897, p. 29.

Boissonneaua jardinei HARTERT, Tierreich, IX, 1900, p. 141.

Eleven specimens, from Nanegal, west Ecuador. The females have

the feathers of the posterior abdomen very broadly tipped with dull ochraceous.

In fine plumage in July and August. These birds are very local, and, unlike many species, they are not found all along the western Andes of Ecuador. Nanegal was the only place where we met with them, though we visited other places at the same altitude and with similar surroundings. Local name, "Vicente."

BOISSONNEAU FLAVESCENS TINOCHLORA, new subspecies.

Fifteen specimens, from Corazón, Pichincha, and Canzacota, west Ecuador. This series, when compared with an equally good series of *Boissonneaua flavescens* from Bogota, makes evident certain differences which surely justify the subspecific separation of the former. The type of *B. flavescens*¹ came from Popayán, Colombia, and though intermediate, is probably nearest like the Bogota bird. The only other synonym is *Ornismia paradisaea*,² described from Bogota; and the Ecuador form thus being without a name, may be described as follows:

Type.—Adult male, No. 174520, U.S.N.M.; west side of Corazón, Ecuador, September, 1898; Goodfellow and Hamilton. Rich metallic green, the crown and breast glittering green; tail darker and duller than the back, the basal three-fourths of all but the middle pair of feathers buffy ochraceous; wing-quills purplish brown, the coverts like the back; abdomen feathers with buffy or whitish margins; lower tail-coverts buffy ochraceous, obsoletely spotted with dusky; tibial tufts white; axillars rufous; lining of wing metallic green.

This race differs from true *flavescens* in the very much broader green tips of the tail-feathers, particularly on the inner webs of the two outer pairs, where they occupy fully a quarter of the total length of the feathers; the wing quills are darker, more purplish; the middle tail-feathers are usually darker; the crissum and the buffy portions of the tail are darker. There is no essential difference in size.

The statement by Hartert³ that in the young the buffy of the outermost tail-feathers reaches to the tips does not hold in this form. Except for rusty edgings to some of the feathers, the immature male is in all respects very similar to the adult female.

A good series collected on Corazón, west Ecuador, at elevations of from 11,000 to 13,000 feet. It was somewhat strange that we never once saw one of these birds on the neighboring mountain of Pichincha, which almost joins Corazón.

VESTIPEDES LUCIANI (Bourcier).

Trochilus luciani BOURCIER, Ann. Sc. Phys. et Nat. Lyon, X, 1847, p. 624.

Eriocnemis luciani GOULD, Mon. Troch., IV, 1853, pl. CCLXXIII.

Forty-six specimens, from the following localities in Ecuador:

¹ Loddiges, Proc. Zool. Soc. Lond., 1832, p. 7.

² Boissonneau, Rev. Zool., 1840, p. 6.

³ Tierreich, IX, 1900, p. 142.

Mojanda; Padregal; Corazón; Aloag, Corazón; Lloa, Pichincha; Pichincha. In this large series there is a surprisingly small amount of individual variation.

Noted on the western Andes at elevations of from 9,000 to 12,000 feet. We found them exceedingly common on Pichincha during the months of November, December, and January, when great numbers of them seemed to arrive suddenly. Local name, "Palo blanco."

VESTIPEDES VESTITUS SMARAGDINIPECTUS (Gould).

Eriocnemis smaragdinipectus GOULD, Ann. and Mag. Nat. Hist., I, 1868, p. 322.

Eriocnemis vestita smaragdinipectus HARTERT, Tierreich, IX, 1900, p. 145.

Three adult males, from Papallacta, east Ecuador. This form is very close to true *vestitus*, but is probably retainable as a subspecies.

From Papallacta, eastern Andes, 11,500 feet, in company with *Laticauda primolina*. Local name, "Calzones blancos."

VESTIPEDES MOSQUERA MOSQUERA (Delattre and Bourcier).

Trochilus mosquera DELATTRE and BOURCIER, Rev. Zool., 1846, p. 306.

Eriocnemis mosquera GOULD, Mon. Troch., IV, 1853, pl. CCLXXIV.

Nine specimens, from Pichincha, Ecuador. So far as these examples indicate, the white bases of the feathers of the chin and upper throat are the mark of the *male*, as the five individuals so sexed have this marking, while the four females lack it entirely. This is exactly opposite to the opinion of Mr. Hartert,¹ who supposed it to be distinctive of the *female*.

Now rare on the mountains in the vicinity of Quito, where they occur at long intervals. We shot them sometimes feeding in the company of *V. luciani*. Local name, "Dorado."

VESTIPEDES LUGENS (Gould).

Eriopus lugens GOULD, Contr. Orn., 1851, p. 140.

Eriocnemis *γ.* *Threptia lugens* REICHENBACH, Aufz. d. Col., 1854, p. 9.

Six specimens (three males and three females), from Papallacta, east Ecuador. One of the males lacks almost entirely the squamate white feather margins of the under surface, but is otherwise not different. According to the evidence of the present series, Mr. Hartert is mistaken in the statement that it is the *male* which has a portion of the tibial tufts dull rufous,² for in all the specimens marked females this coloring is present, while in those sexed as males the tufts are pure white. He is, however, undoubtedly correct in considering *V. squamata* and *V. lugens* merely different sexes of the same species.

From the eastern Andes, at 11,500 feet. Local names, "Quinde feó" and "Oscuros."

¹Tierreich, IX, 1900, p. 147.

²Tierreich, IX, 1900, p. 148.

VESTIPEDES NIGRIVESTIS (Bourcier).

Trochilus nigrivestis BOURCIER, Ann. Sc. Phys. et Nat. Lyon, IV, 1852, p. 144.

Eriocnemys nigrivestis BONAPARTE, Rev. et Mag. Zool., 1854, p. 252.

Twenty-three specimens, from Atacazo and from Pichincha (12,000 feet to summit), Ecuador.

These little hummingbirds probably range to a higher altitude than any others in Ecuador. When camping on Pichincha at 14,500 feet elevation, we often saw them flying past our tents in a blinding snowstorm, uttering their rather harsh note, and taking shelter for the night under the cliffs above us, where we found their deserted nests under the ledges. I also saw them on several occasions at 15,500 feet, near the edge of the crater, but this was at times when there was little snow on the mountain. They hover close to the ground, feeding on the small obscure flowers which manage to flourish among the cinders and ash. The males are locally called "Quinde negro" or black humming bird, but the females are known by the name of "Pichinchanos." We never saw the two sexes together, and all the females we procured were shot, at from 9,000 to 10,000 feet, on the west and north sides of the mountain, but we saw no males at such a low elevation.

VESTIPEDES ALINAE (Bourcier).

Ornismya alinae BOURCIER, Ann. Sc. Phys. et Nat. Lyon, V, 1842, p. 344, pl. xix.

Eriocnemis α . *Engyete alina* REICHENBACH, Aufz. d. Col., 1854, p. 9.

Two adult males from Pasto, southern Colombia. These are rather larger than two specimens from Bogota, and have considerably more of a reddish gold tinge in the malar region, but the available material is too limited to determine the significance of these differences.

From near Pasto, south Colombia, at about 9,000 feet elevation. Local name, "Esmeraldas."

VESTIPEDES DERBYI DERBYI (Delattre and Bourcier).

Trochilus derbyi DELATTRE and BOURCIER, Rev. Zool., 1846, p. 306.

Eriocnemis γ . *Threptia derbyi* REICHENBACH, Aufz. d. Col., 1854, p. 9.

Three specimens from Pasto, southern Colombia. The difference in the color of the upper tail-coverts, assigned by Mr. Hartert to separate the present form from *V. derbyi longirostris*,¹ is apparently of no value; but the length of the bill is probably sufficient for the recognition of the latter.

Shot along the hedgerows on the south road above the town of Pasto. Local name, "Calzones negros."

OCREATUS MELANANTHERUS (Jardine).

Trochilus (Spathura) melananthera JARDINE, Cont. Orn., 1851, p. 111, pl. lxxx.

Ocreatus melanantherus HARTERT, Tierreich, IX, 1900, p. 151.

Eighteen specimens, from Milligalli, Mindo, and Gualea, west Ecuador. Immature males are practically identical with adult females. One of the adult males in this series exhibits an interesting abnor-

¹Tierreich, IX, 1900, p. 149.

malinity, evidently tending toward albinism. The upper parts and posterior lower surface are almost uniform pale brown, though somewhat lighter on the lower back; the wings, tail and auriculars are of a darker shade of the same color; the tibial tufts are white, as usual; while the throat is dull metallic brown, slightly darker and more rufescent than the color of the upper surface.

These hummingbirds have a pretty habit of suddenly rising from the tops of the bushes for some yards into the air, where they remain poised for a few seconds, uttering some very sweet notes, then suddenly descend. Often two would meet thus in the air, but only the males do this. Local name, "Tijerettas"—scissortail.

OCREATUS CISSIURUS (Gould).

Spathura cissiura GOULD, Proc. Zool. Soc. Lond., 1853, p. 109.

Ocreatus cissiurus HARTERT, Tierreich, IX, 1900, p. 151.

One adult male from Baeza, east Ecuador.

Confined to the eastern side and rare at Baeza. The single specimen we obtained was feeding on the flowers of a small ground plant close to our hut.

UROSTICTE BENJAMINI (Bourcier).

Trochilus benjamini BOURCIER, Compt. Rend. Ac. Sci., XXXII, 1851, p. 187.

Urosticte benjamini GOULD, Mon. Troch., III, 1853, pl. cxc.

Twelve specimens, from Gualea and Santo Domingo, west Ecuador. One of these is an immature male and differs from that of *Urosticte ruficrissa*, as do the females of these two species—in the color of the crissum.

Local name, "Cinco reales"—five reals; but why they are called by such a curious name I was unable to find out.

ADELOMYIA MELANOGENYS MELANOGENYS (Fraser).

Trochilus melanogenys FRASER, Proc. Zool. Soc. Lond., 1840, p. 18.

Adelomyia melanogenys SCLATER, Proc. Zool. Soc. Lond., 1859, p. 145.

Fourteen specimens, from Papallacta and Baeza, east Ecuador.

ADELOMYIA MELANOGENYS MACULATA (Gould).

Adelomyia maculata GOULD, Mon. Troch., III, 1861, pl. cxcix.

Adelomyia melanogenys maculata HARTERT, Tierreich, IX, 1900, p. 155.

Thirteen specimens, from above Milligalli; Canzacota; and the west side of Pichincha, west Ecuador. These bear out the differences mentioned by Hartert¹ as separating this form from true *melanogenys* of the east side of the mountains.

Very silent birds, which seem to spend most of their time sitting about on the bushes and branches near the ground, a trait that has earned for them the native name of "Muertes."

¹Tierreich, IX, 1900, pp. 154, 155.

HELIANGELUS STROPHIANUS (Gould).

Trochilus (—?) *strophianus* GOULD, Proc. Zool. Soc. Lond., 1846, p. 45.

Helianthus strophianus BONAPARTE, Consp. Avium I, 1850, p. 76.

Thirty-five specimens, from the following localities: San Gabriel; Guala; Canzacota; lower west side of Pichincha, Ecuador; Popayán, Colombia. The birds from San Gabriel have the rump only a little more bronzy than the back, but as this is also the case in some of the specimens from other localities, no importance attaches thereto. The single bird from Popayan adds the species to the fauna of Columbia. The throat in this individual is rather more violet purple than in any of the others, in this respect apparently approaching *Helianthus violicollis*, but it otherwise does not differ from typical specimens of *strophianus*. Whether or not *Helianthus violicollis* is a good species can of course not be determined by the present material, but too much importance must not be attached to the precise shade of metallic feathers in separating species of hummingbirds. In the present series there is an unbroken range of shades in the metallic throat patch of various individuals, from the violet purple of this Popayan specimen to a pure solferino, and this variation is not at all correlated with locality, but is undoubtedly individual, induced doubtless in part at least by the difference in age of the feathers and the amount of wear to which they have been subjected.

One shot in the patio of a house near Popayán, southern Colombia, at 5,600 feet, where it was hunting for spiders under the veranda. Local name, "Cravata malva."

HELIANGELUS AMETHYSTICOLLIS (d'Orbigny and Lafresnaye).

Orthorhynchus amethysticollis D'ORBIGNY and LAFRESNAYE, Mag. Zool., VIII, 1838, p. 31.

Helianthus amethysticollis BONAPARTE, Consp. Avium, I, 1850, p. 76.

One adult male from below Baeza, on the road to Archidona, east Ecuador.

I believe this species has not been recorded before from Ecuador. The single specimen was obtained on a river bank a little below Baeza, on the eastern side of the eastern Andes, where we noticed it darting out into the air from a branch to catch the small gnats hovering over the water.

HELIANGELUS EXORTIS EXORTIS (Fraser).

Trochilus exortis FRASER, Proc. Zool. Soc. Lond., 1840, p. 14.

Helianthus exortis HARTERT, Tierreich, IX, 1900, p. 160.

Five specimens from Papallacta, east Ecuador. They have been compared with a good series from the vicinity of Bogota, Colombia, the type locality, and seem to be identical.

HELIANGELUS EXORTIS SODERSTROMI, new subspecies.

A single specimen from the lower side of Corazón, Ecuador, is the only one in the collection, but it differs so much from birds taken on the eastern Andes that in all probability it represents the form of this species occurring on the west side of the mountains. It differs from true *exortis* in its very much smaller size and in the decidedly more golden tint of the green portions of the plumage, this particularly evident on the upper surface. It may be described as follows:

Type.—No. 174008, U.S.N.M., male adult: lower west side of Corazón, Ecuador, September, 1898; Goodfellow and Hamilton. Body plumage golden bronze green, least golden on back and sides; a glittering green frontal patch; middle of chin violet blue, shading into solferino on the center of the throat; wing quills fuscous, with a gloss of purplish or bluish; tail bluish black, the two middle feathers green like the rump; feathers of central abdomen edged with buffy grayish; under tail-coverts white. The following measurements show the difference in size between the two forms:

Name.	Sex.	Locality.	Wing.	Tail.	Exposed culmen.
<i>Helianthus exortis exortis</i>	Male adult.	Papallacta, east Ecuador.....	67	48	17
<i>Helianthus exortis soderstromi</i>	do.....	Corazón, west Ecuador	62	42	15

At the request of Mr. Goodfellow this race is named for Mr. Soderstrom, the English consul-general at Quito, who manifested much interest in the gathering of the present collection.

HELIANGELUS VIOLA Gould.

Helianthus viola GOULD, Proc. Zool. Soc. Lond., 1853, p. 61.

Four specimens, from Papallacta, east Ecuador, and the west side of Pichincha, west Ecuador.

LATICAUDA PRIMOLINA (Bourcier).

Metallura primolinus BOURCIER, Rev. et. Mag. Zool., 1853, p. 295.

Seventeen specimens, from the following localities in Ecuador: Papallacta; road to Baeza; Curiurcu (above Baeza).

Generally in the company of *Adelomyia melanogenys*, feeding on the wild fuchsias.

LATICAUDA TYRIANTHINA TYRIANTHINA (Loddiges).

Trochilus tyrianthinus LODDIGES, Proc. Zool. Soc. Lond., 1832, p. 6.

Metallura tyrianthinus BONAPARTE, Consp. Avium, I, 1850, p. 75.

Sixteen specimens, from Papallacta, east Ecuador. These agree closely with a series of true *tyrianthina* from Colombia, differing only in averaging slightly paler below, verging thus a little toward

L. tyrianthina quitensis. From specimens collected at various localities on the west slopes of the mountains, and which represent *quitensis*, the present birds differ very materially, being decidedly smaller, rather darker, less brownish below, and with a more purplish gloss to the tail.

LATICAUDA TYRIANTHINA QUITENSIS (Gould).

Metallura quitensis GOULD, Introd. Troch., 1861, p. 112.

Metallura tyrianthina quitensis E. and CL. HARTERT, Novit. Zool., I, 1894, p. 48.

Twenty-eight specimens, from the following localities in Ecuador: Pichincha; Atacazo; Jambillo; Jablon; Corazón. This is a readily recognizable race, and replaces true *tyrianthina* on the west side of the mountains. An adult male from Atacazo exhibits a very pretty case of partial albinism, the whole forehead being pure white, and a few white feathers intermingled with the plumage of the breast. Albinism seems to be of rather rare occurrence among the Trochilidae, thus making this case worthy of record.

A very common bird in western Ecuador at altitudes between 9,000 and 12,000 feet, and, like all the other members of this genus we came across, were chiefly found feeding very early in the morning; often at no other part of the day could we find them. Local name, "Ubellus comun."

CHALCOSTIGMA HERRANI (Delattre and Bourcier).

Trochilus herrani DELATTRE and BOURCIER, Rev. Zool., 1846, p. 309.

Chalcostigma herrani SIMON, Cat. Troch., 1897, p. 33.

Six specimens from Pichincha, west Ecuador.

These birds appear on Pichincha about January and remain until May, when they entirely disappear, no one knows whither. During their stay they seem to frequent only the west and north sides of the mountain, at about 12,000 feet elevation. I was told that some years very few come, and that they sometimes stay away for two years together. Local name, "Ubellus finos."

CHALCOSTIGMA STANLEYI (Bourcier).

Trochilus stanleyi BOURCIER, Compt. Rend. Ac. Sci., XXXII, 1851, p. 187.

Chalcostigma stanleyi SIMON, Cat. Troch., 1897, p. 33.

Four specimens, from Papallacta and Pichincha, Ecuador.

RAMPHOMICRON MICRORHYNCHUM (Boissonneau).

Ornismya microrhyncha BOISSONNEAU, Rev. Zool., 1839, p. 354.

Ramphomicron microrhyncha BONAPARTE Consp. Avium, I, 1850, p. 79.

Thirty-five specimens, from Papallacta (11,500 feet) and Pichincha, Ecuador. There seems to be absolutely no appreciable difference between birds from these two localities which represent respectively the east and west sides of the mountains. Examples from Colombia have often a somewhat shorter wing, and in the males there is frequently a deeper ochraceous suffusion on the posterior lower parts, but these characters are apparently too inconstant to warrant recognition in nomenclature. Several of the young males in the present

series are in process of change from the green-backed to the purple-backed plumage, and exhibit various stages in this transition, from the presence of a few purple feathers sprinkled among the green to an almost solidly purple upper surface with a few scattered green feathers. So far as these examples indicate, the sides of the neck and back are the last portions to change.

From both sides of the Andes at elevations of from 10,000 to 12,000 feet. Local name, "Obispos"—bishops.

OPISTHOPRORA EURYPTERA (Loddiges).

Trochilus eurypterus LODDIGES, Proc. Zool. Soc. Lond., 1832, p. 7.

Opisthoprora euryptera CABANIS AND HEINE, Mus. Hein., III, 1860, p. 76.

Four specimens from Papallacta, east Ecuador. This is apparently the first time the species has been taken in Ecuador, but these examples are exactly like a specimen from Colombia. The female is colored like the male, but is appreciably smaller.

From Papallacta, east Ecuador, 11,500 feet. Four shot on the same tree—one on each of four successive mornings. They feed on the flowers of the red datura and pierce them with their bills at the base.

CYANOLESBIA KINGII MOCOA (Delattre and Bourcier).

Trochilus mocoa DELATTRE AND BOURCIER, Rev. Zool., 1846, p. 311.

Cyanolesbia kingii mocoa SIMON, Cat. Troch., 1897, p. 34.

Thirty-three specimens, all from Baeza, east Ecuador.

The typical form of this species is the *Cyanolesbia cyanura* of Hartert,¹ which is the *Cyanolesbia gorgo* of Salvin² and Sharpe.³ Neither of these names is, however, the proper one for the species, since the first is preoccupied by *Trochilus cyanurus* Gmelin⁴ and Vieillot,⁵ and the second is antedated by *Ornismya kingii* Lesson,⁶ which last name, though based on a bird from erroneous locality, must become the proper name for the species. The various races, according to Hartert's catalogue,⁷ will thus stand as follows:

Cyanolesbia kingii kingii (LESSON).

Cyanolesbia kingii emmae (BERLEPSCH).

Cyanolesbia kingii mocoa (DELATTRE AND BOURCIER).

Cyanolesbia kingii smaragdina (GOULD).

Cyanolesbia kingii margarethae (HEINE).

Cyanolesbia kingii caudata (BERLEPSCH).

¹Tierreich, IX, 1900, p. 175.

²Cat. Birds Brit. Mus., XVI, 1892, p. 137.

³Hand List Gen. and Spec. Birds, II, 1900, p. 135.

⁴Syst. Nat., I, 1788, p. 485.

⁵Nouv. Dict. d'Hist. Nat., VII, 1817, p. 369.

⁶Hist. Nat. Troch., 1832, p. 107, pl. xxxviii.

⁷Tierreich, IX, 1900, pp. 175-177.

Confined to the eastern side of the eastern Andes, and we secured a large series at Baeza in March, most of them then being in beautiful plumage. They feed on the flowers of a high tree, so that we had to use a gun to secure them, which is a pity as it often spoils their long tails. Local name, "Cola verde"—green tail.

CYANOLESBIA COELESTIS (Gould).

Cyananthus caelestis GOULD, *Introd. Troch.*, 1861, p. 102.

Cyanolesbia caelestis SALVIN, *Catbirds Brit. Mus.*, XVI, 1892, p. 139.

Twenty-one specimens, from Gualea and Milligalli, west Ecuador.

Confined to the western side, and in beautiful plumage in August and September. Their favorite flowers seem to be those of the papaya tree, but in some localities we found them feeding only on the coffee flowers. Their stomachs also contained insects, which I have seen them fly into the air and take on the wing. Local name, "Cola azul"—blue tail.

PSALIDOPRYMNA VICTORIAE AEQUATORIALIS (Boucard).

Lesbia aequatorialis BOUCARD, *Humming Bird*, III, 1893, p. 6.

Psalidoprymna victoriae aequatorialis HARTERT, *Novit. Zool.*, VI, 1899, p. 74.

Fifty-six specimens, from the following localities in Ecuador: Quito; north of Quito; Chillo Valley; Aloag; Mojanda; Jambillo; road to Papallacta; near Julcan; Padregal. Even with this fine series it is not very easy to distinguish *aequatorialis* from true *victoriae*, but its average characters are probably sufficient to entitle it to recognition.

Very common in the gardens of Quito and its neighborhood, but not observed by us at elevations above 10,000 feet nor below 8,000. They are very tame, and appear to breed nearly all the year round, December and January being the only months when we did not find their nests. The nest is loosely constructed and rather slipper-shaped, and we found them in all sorts of positions, chiefly among the creepers on old walls, but also one in a fuchsia bush, as well as many others suspended from the ends of the branches of large eucalyptus trees, but always well concealed. The female sits in the nest with the tail turned up over the back. Although these birds feed indiscriminately from all the flowers in the gardens, they certainly prefer the fuchsia, and one can see all the unopened buds pierced in many places at the base of the calyx by these birds' bills. At the close of the day, especially after rain, numbers of the birds fly about in the gardens, and it is curious to observe the way in which they turn up their long tails often nearly parallel with the body, while the usual position when feeding is to hold it at right angles to the body. I did not once observe them spread the tail-feathers out when flying. When courting, the males fly straight up into the air, almost out of sight, like an arrow shot from a bow, singing a remarkably melodious song, and then return again to chase the females about the garden. So tame are these birds in the towns that I have often secured them by pinching the base of the flower together when one had its bill inside, but I always gave birds so obtained their freedom again. Local name, "Cola larga"—long tails. One specimen we shot I think must have had a record tail for length.

PSALIDOPRYMNA GOULDI GRACILIS (Gould).

Trochilus (Lesbia) gracilis GOULD, *Proc. Zool. Soc. Lond.*, 1846, p. 86.

Psalidoprymna gouldi gracilis HARTERT, *Novit. Zool.*, VI, 1899, p. 75.

Twenty-four specimens, from Papallacta, Pichincha, and the west side of Corazón, Ecuador. This form differs from true *P. gouldi* of

Colombia in its smaller size, this most appreciable in the tail (of males), though the bill averages decidedly shorter.

We never observed them in Quito, but in November and December we found them fairly numerous on the slopes of Pichincha above Quito. Local name, "Finos."

ZODALIA THAUMASTA, new species.

Chars. sp..—Similar to *Zodalia glyceria* (Gould), but with no whitish on any of the tail feathers; the glittering throat patch grass green instead of olive; bill of greater length; wings and tail slightly shorter.

Description..—Type, adult male, No. 173911, U.S.N.M.; Illalo, Valley of Chillo, Ecuador, November, 1898; Goodfellow and Hamilton. Upper surface shining bluish green; wings dark brown with a purplish gloss, the superior wing-coverts like the upper parts; tail rich purple, the middle rectrices tipped with bluish green, the outermost pair with the outer webs and margins of inner webs deep brown washed with purplish; sides of head and neck like the back; chin and throat glittering grass green; breast and abdomen shining bluish green, the feathers with ochraceous margins, these most extensive posteriorly; lower tail-coverts ochraceous buff spotted with purplish; lining of wing bluish green with rusty edgings. Length of wing, 62 mm.; tail, 77 mm.; exposed culmen, 15 mm.

Adult female..—Upper parts, tail, and wings similar to the male but duller; lower surface deep buff, spotted with bluish green, these markings largest on breast and sides; crissum almost immaculate. Length of wing, 56 mm.; tail, 49 mm.; exposed culmen, 14 mm.

The two specimens above described are both from the same locality and are the only ones of this very interesting new species of a rare and little-known group. The black shafts and uniform deep brown of the exterior webs of the outer tail-feathers distinguish at sight the male of this species from that of *Zodalia glyceria*, and other differences not apparent from descriptions might be found were specimens of the two compared. If the female of *Zodalia ortonii*, described by Salvin¹ and by Hartert,² belong really to that species, and be not simply the immature of *Z. thaumasta*, the female of the latter may be distinguished from the same sex of the former by the entire lack of whitish tips to the tail-feathers.

Perhaps this is the rarest of all the Ecuadorian humming birds, and is probably now almost extinct. I was told by an old resident in Quito, and one who knows all the birds well, that in the parts they once frequented they had not been seen for years, in fact, not since the last eruption of Cotopaxi. He said they built their nests on the maize stalks, in the vicinity of that volcano, and were nesting at the time of the last great eruption, when the country for many miles around was covered deep in ashes, and darkness reigned for two days. Numbers of birds of all sorts perished at this time, and probably the young and nests of *Z. thaumasta* also, which inhabited

¹ Cat. Birds Brit. Mus., XVI, 1892, p. 142.

² Tierreich, IX, 1900, p. 184.

only the end of the Chillo Valley nearest to the volcano. That they are exceedingly rare is quite certain, for though we were constantly out there for two months, and had shooters out besides, we saw none but the one pair secured.

SCHISTES ALBOGULARIS Gould.

Schistes albogularis GOULD, Contr. Orn., 1851, p. 140.

Fourteen specimens, all from Milligalli, west Ecuador, September, 1898. Among them are four white-throated birds, one of which is evidently an immature male, the others adult females, thus leaving little doubt of the correctness of Mr. Salvin's opinion.¹

They evidently occur only periodically at Milligalli, for during the month of September we shot 14 there in fine plumage; while a few weeks later we failed to find one in their old haunts, although the flowers they fed on were still in bloom. This was the only place we met with them. Local name, "Orejas de fuego"—fire ears.

HELIOTHRIX AURITUS (Gmelin).

Trochilus auritus GMELIN, Syst. Nat., I, 1788, p. 493.

Heliothrix auritus BOIE, Isis, 1831, p. 547.

Two adult males from Archidona, Rio Napo, April, 1899. One of these has a decided coppery tinge on the nape.

HELIOTHRIX BARROTI (Bourcier).

Trochilus barroti BOURCIER, Rev. Zool., 1843, p. 72.

Heliothrix barroti GRAY, Genera Birds, I, 1848, p. 115.

Fourteen specimens, eight of them males, all from Santo Domingo, west Ecuador; September and October, 1898.

No specimens from the type locality of this species, Carthagena, United States of Colombia, have been available, but these Ecuador examples seem to be indistinguishable from Panama and Veragua specimens, with which true *Heliothrix barroti* is undoubtedly identical. Birds from Guatemala, Honduras, and Costa Rica, however, have much longer wings and tails, slightly longer bills, and more restricted bluish purple crown patches, differences sufficient to entitle them to subspecific separation. There is no name available for this form since *Heliothrix purpureiceps* Gould,² from Papayán, Colombia, and *Heliothrix violifrons* Gould,³ from Veragua, belong both to true *Heliothrix barroti*. The Central American race may therefore be called *Heliothrix barroti alincius*.⁴

¹ Cat. Birds Brit. Mus., XVI, 1892, p. 35.

² Proc. Zool. Soc. Lond., 1855, p. 87.

³ Introd. Troch., 1861, p. 122.

⁴ New subspecies; *type*, No. 33649, U.S.N.M., Choctun, Vera Paz, Guatemala, 1862; O. Salvin. Crown and post-auricular patch metallic bluish purple; rest of upper surface brilliant grass green with a golden tinge in places; wings blackish slate, the coverts like the back; middle tail-feathers dark steel blue, the three outer pairs white; lores, cheeks, and auriculars, black; sides of chin and throat glittering green; remainder of lower parts white. Length of wing (*type*), 66 mm.; tail, 50 mm.; exposed culmen, 17 mm.

Immature specimens of *Heliothrix barroti* resemble in color the adult females, but the feathers of the upper surface are more or less margined with rusty, this persisting longest on the head.

Confined to the western side. These birds fly very rapidly and are somewhat difficult to shoot. Local name, "Angel quinde."

FLORICOLA ALBICRISSA (Gould).

Heliomaster albicrissa GOULD, Proc. Zool. Soc. Lond., 1871, p. 504.

Floricola albicrissa ELLIOT, Classif. Synop. Troch., 1879, p. 83.

Four specimens from Nanegal, west Ecuador. There is considerable individual variation in the color of the crown and throat, in some cases these parts being exactly like the same in *Floricola superba*, thus obliterating the specific differences based thereon. The plain grayish white crissum will, however, always serve to distinguish the present species.

MYRTIS FANNY (Lesson).

Ornismya fanny LESSON, Am. Sci. Nat., 2d ser., IX, 1838, p. 170.

Myrtis fanny CABANIS and HEINE, Mus. Hein., III, 1860, p. 59.

Thirty specimens, from Chillo and Chota valleys, Ecuador. There is considerable variation in the amount of rufous on the lower surface in different examples, but this is apparently not to be correlated with locality. Immature males resemble the females. Contrary to the statement of Hartert,¹ birds from Ecuador seem to average slightly larger than those from Peru, but there is no other observable difference.

Common in parts of the Chillo Valley in January. They feed chiefly on the flowers of the giant aloe, but we occasionally shot them about the guava flowers. Only one female was obtained out of a series of 30. Local name, "Prelado"—prelate.

MYRMIA MICRURA (Gould).

Calothorax micrurus GOULD, Proc. Zool. Soc. Lond., 1853, p. 109.

Myrmia micrura Mulsant and Verreaux, Hist. Nat. Ois.-Mouches, IV, 1877, p. 113.

A single adult male from Santo Domingo, west Ecuador, taken in October, 1898, is the only specimen in the collection. This adds the species to the fauna of Ecuador, extending its range at least 300 miles, but this specimen seems to be typical, at least in so far as it is possible to judge from descriptions.

A single specimen killed at Santo Domingo at dusk. Our attention was attracted to it by seeing it drive all other hummingbirds, large or small, away from the orange tree on which it was feeding. Being so small they are very difficult to shoot, as they seldom settle for an instant. Local name, "Quinde mosca"—fly hummingbird.

¹Tierreich, IX, 1900, p. 195.

CALLIPHLOX MITCHELLII (Bourcier).

Trochilus mitchellii BOURCIER, Proc. Zool. Soc. Lond., 1847, p. 47.

Calliphlox mitchelli GOULD, Mon. Troch., III, 1860, pl. CLX.

Seven specimens, from Milligalli and Gualea, west Ecuador, and Baeza, east Ecuador. The single male from the east side of the mountains is considerably smaller than corresponding individuals from the west side; but as no eastern adults are available, proper comparisons can not be made. Four immature males differ from an adult female in being less uniformly rufous-chestnut below the anterior portions being much lighter, even whitish.

CHAETOCERCUS MULSANTI (Bourcier).

Ornismya mulsanti BOURCIER, Ann. Sc. Phys. et Nat. Lyon, V, 1842, p. 344, pl. xx.

Chaetocercus mulsanti CABANIS and HEINE, Mus. Hein., III, 1860, p. 60.

Twenty-four specimens, from the following localities: Corazón, Pichincha, Jombaco (valley of Chillo, near Quito), west Ecuador; and Papallacta, east Ecuador. There seems to be no constant difference between these and Colombian specimens. Birds from both sides of the mountains appear to be identical. The immature male differs from the adult female in the lack of rufescent tinge on the anterior lower parts, in the less extent of rusty on the abdomen, and in the buffy or ochraceous instead of rufous or chestnut shade of the crissum and tips to the tail-feathers. One of the young males appears to be abnormal in having the throat of a brownish gray shade instead of white, though this condition is indicated in one or two other specimens.

Found feeding chiefly on the flowers of the guava tree and in rather dry, sandy localities. Adult males always seemed very scarce, but immature males and females were fairly numerous in certain parts of the Chillo Valley in December and January. Local name, "Soldado."

POLYXEMUS BOMBUS (Gould).

Chaetocercus bombus GOULD, Proc. Zool. Soc. Lond., 1870, pp. 803, 804.

Polyxemus bombus MULSANT and VERREAUX, Hist. Nat. Ois.-Mouches, IV, 1877, p. 123, pl. CXI.

Four specimens, from Guayaquil and Santo Domingo, west Ecuador. An immature male is practically identical in plumage with the adult female.

Mr. Hartert is undoubtedly right in merging *Chaetocercus* with *Aesctrura*, for *C. jourdanii*, the type of the former, is undoubtedly congeneric with *C. mulsanti*, the type of the latter. The present species is, however, by reason of its very short wings and narrow, lengthened tail feathers, generically distinct from the species with which it has commonly been associated.

Found feeding just before dusk on the orange flowers at Santo Domingo. They so exactly resemble the hawk moths also seen around the flowers at the same time that

it was impossible on the wing to distinguish one from the other, and on one or two occasions Mr. Hamilton actually killed moths with a pellet from the blowpipe, mistaking them for the hummingbirds.

PEPELAIRIA PEPELAIRII (Du Bus).

Trochilus popelairii Du Bus, Esq. Orn., 1846, pl. vi.

Popelairia popelairiei SIMON, Cat. Troch., 1897, p. 41.

One adult male from Archidona, east Ecuador.

PEPELAIRIA LANGSDORFFI (Temminck).

Trochilus langsdorffi TEMMINCK, Planch. Color., 1821, pl. LXVI, fig. 1.

Popelaria langsdorffi RIDGWAY, Proc. U. S. Nat. Mus., III, 1880, p. 315.

One specimen from Coca, Rio Napo, east Ecuador. This is an immature male, differing from the adult of the same sex in the lack of the long tail-feathers and in the slight indication of the reddish bronze breast patch.

PEPELAIRIA CONVERSII AEQUATORIALIS (Berlepsch and Taczanowski).

Gouldia conversi aequatorialis BERLEPSCH and TACZANOWSKI, Proc. Zool. Soc. Lond., 1883, p. 567.

Popelairia conversi aequatorialis HARTERT, Novit. Zool., V, 1898, p. 494.

Five specimens from Santo Domingo and Nanegal, west Ecuador. Among the females there is considerable difference in the amount of white on the posterior lower surface. The female of this species may be distinguished from that of *Popelairia langsdorffi* by its shorter bill and more solidly black throat.

A REVIEW OF THE DISCOBOLOUS FISHES OF JAPAN.

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In the present paper is given a review of the Discoboli (*Cyclopteridæ* and *Liparididæ*) found in the waters of Japan. It is based on the collections made by the writers in 1900, on the collections in the United States National Museum, and on the collections of the United States Fish Commission steamer *Albatross* made during the same year, which have been deposited in the United States National Museum.

The Discoboli are degenerate cottiform fishes, characterized as such by the presence of the suborbital stay. From related families they are separated by the obsolete mydome, by the reduced ventrals united to form a sucking disk or altogether wanting, and by the little development of the spinous dorsal.

The two families are thus separated:

- a.* Body cavity large, caudal region short, skin prickly or smooth...CYCLOPTERIDÆ, I.
aa. Body cavity short, caudal region elongate, skin smooth.....LIPARIDIDÆ, II.

Family I. CYCLOPTERIDÆ.

THE LUMP SUCKERS.

Body short and thick, more or less elevated, covered with a thick skin, which is smooth, tubercular, or spinous; head short and thick; suborbital stay present, thin and flattish; mouth small, terminal; jaws with bands of slender, simple teeth; no teeth on vomer or palatines; gill openings narrow, restricted to the sides, the membranes being broadly joined to the isthmus and shoulder girdle; branchiostegals 6; gills $3\frac{1}{2}$; pseudobranchiæ present; dorsal fins 2, the anterior part of flexible spines, which, in the adult, are sometimes hidden by a fleshy hump, in one subfamily entirely wanting; soft dorsal usually opposite the anal and similar to it; caudal fin rounded, free from the dorsal and anal; ventrals thoracic, rudimentary, forming the bony center of a sucking disk; pectorals short, placed low, their bases broad and pro-current; pyloric cæca numerous; intestine elongate; vertebrae 12+16,

the skeleton feebly ossified. Northern seas of both hemispheres. By means of the adhesive ventral disk these fishes are enabled to attach themselves very firmly to rocks or other objects. They feed on crustacea, worms, small fishes, and plants. The young of *Cyclopterus* bear a close resemblance to *Liparis*, an evidence of the common origin of the 2 groups which is borne out by the anatomy.

Cyclopterinae :

I. Spinous dorsal present, sometimes concealed in adult.

a. Barbels small or none; disk anterior, below the head.

b. Skin naked or with scattered slender spines; no lateral line. *Lethotremus*, 1.

Liparopsinae :

II. Spinous dorsal wholly wanting.

a. Dorsal short, opposite anal, of 9 or 10 rays; skin wholly smooth, without bony tubercles *Cyclopterichthys*, 2.

1. LETHOTREMUS Gilbert.

Lethotremus GILBERT, Rept. U. S. Fish Comm., 1893 (1896), p. 449 (*muticus*).

This genus differs from *Eumicrotremus* in the total absence of the bony plates and of a lateral line or pores on sides of head and body. The skin is smooth in the typical species.

The ventral disk is large, placed below the gill openings and base of pectoral. Barbels absent in the typical species, present in the Japanese. The body is almost spherical except for the short tail. The spinous dorsal is well developed. Gill opening very small. The genus is very close to *Cyclopteroides* from Bering Sea, differing chiefly in the absence of prickles and perhaps in the more anterior insertion of the ventral disk.

(ληθή, forgetfulness; τρημα, aperture.)

I. LETHOTREMUS AWÆ Jordan and Snyder, new species.

Head $2\frac{1}{2}$ in length; depth 2; depth of caudal peduncle $3\frac{1}{2}$ in head; length of snout 4; diameter of orbit $3\frac{1}{2}$; width of interorbital space $2\frac{1}{2}$; D. VI, 8; A. 7; P. 21.

The body is almost globular, the width about equal to the depth; the tail compressed posteriorly. Head large, snout short, the jaws about equal. Eye large, lateral, situated much nearer to snout than to gill opening, the preorbital area about equal to diameter of pupil; interorbital area broad and flat. Mouth somewhat oblique, the cleft extending backward to a perpendicular passing between pupil and anterior part of orbit; jaws with broad bands of close-set, blunt teeth. Gill opening narrow, located about midway between upper edge of base of pectoral and insertion of dorsal, the flap triangular in shape.

Skin smooth. A short barbel above eye, posterior to nostril; a long, slender barbel on lower jaw; a second, similar one at lower edge of

cheek, on a vertical passing between pupil and posterior edge of orbit; a third just posterior to angle of preopercle.

Dorsal fins 2, the first inserted immediately above gill opening; its rays enveloped in a thick, fleshy covering which almost completely conceals them; insertion of second dorsal a little in advance of anal, the rays of both fins with thin membranes, extending when depressed a little beyond base of caudal. Pectoral large, rounded posteriorly, its edge continuous. Ventral disk round, with a wide, free margin; its diameter contained $1\frac{2}{3}$ times in length of head.

Color in spirits, light brown, without spots or bands.

The species is known from specimens about 300 millimeters in length, from Kominato, in the province of Awa, at the mouth of Tokyo Bay.

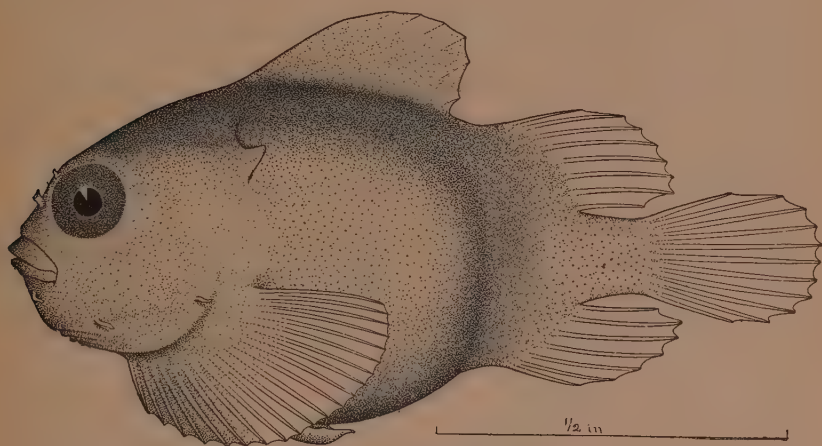


FIG. 1.—LETHOTREMUS AWÆ.

Type.—No. 6539, Leland Stanford Junior University Museum.

One of the cotypes differs from the specimen described in having a long, slender barbel over eye, posterior to nostril tube; a row of 4 small, slender barbels below eye; a row of 4—the first of which is shortest, the last being longest—extending from near mandibular symphysis posteriorly to opercle; a few minute barbels on upper posterior part of head.

The type and other specimens were presented to the university by Dr. Ishikawa. Similar examples are in the Imperial Museum of Tokyo, No. 629.

2. CYCLOPTERICHTHYS Steindachner.

Cyclopterichthys STEINDACHNER, Ichth. Beiträge, X, 1881, p. 14 (*glaber*=*ventricosus*).

Body short and thick, rounded, covered with thick, smooth skin, destitute of bony tubercles; tail slender, compressed, the body abruptly contracted to its base; head broad, obtuse; mouth oblique, the lower

jaw prominent; teeth rather small, simple, hooked, sharp, in 2 rows anteriorly; pseudobranchiæ large; gills $3\frac{1}{2}$; suborbital connected by a bony stay with the preopercle; gill opening small, above the base of the pectoral, which is broad and procurrent; ventral disk moderate, fringed. Dorsal short and high, of soft rays only, opposite the short anal, both well separated from the small caudal. (*Cyclopterus*; $\iota\chi\theta\upsilon\varsigma$, fish.)

2. CYCLOPTERICHTHYS VENTRICOSUS Pallas.

Cyclopterus ventricosus PALLAS, Spicilegia Zool., VII, 1769, p. 15, pl. II; Kamchatka.

Cotylis ventricosus GÜNTHER, Cat., III, 1861, p. 498 (copied).

Cyclopterichtys ventricosus JORDAN and GILBERT, Synopsis 1883, p. 745 (after Steindachner).—GARMAN, Discoboli, 1892, p. 41.—JORDAN and EVERMANN, Fishes of North and Middle America, II, 1898, p. 2104; St. Paul Island, Pribilof, Petropaulski.—JORDAN and GILBERT, Fishes of Bering Sea, III, p. 475; Petropaulski, St. Paul, Bering Island, Atka.

Cyclopterichtys glaber STEINDACHNER, Ichth. Beitr., X, 1881, p. 14, pl. VIII; Ochotsk Sea.

Head 3 in length; depth $3\frac{1}{2}$; depth of caudal peduncle $3\frac{2}{3}$ in head; length of snout 3; maxillary $2\frac{1}{2}$; eye 6; interorbital space $1\frac{4}{5}$; D. 9; A. 7; P. 20.

Body stout, thick, abruptly compressed behind; the head broad, depressed, slightly convex on the crown; the snout blunt, broadly rounded when seen from above. Mouth wide, the angle on a line passing about midway between tip of snout and eye, the lower jaw projecting beyond the upper; teeth small, simple, pointed, close set; in 2 prominent series, the outer ones minute, especially on posterior part of lower jaw; 3 or 4 large teeth form a third rather indefinite inner series on front of jaws. Eye lateral, much nearer to tip of snout than to gill opening. Gill slit about 5 in head, with a rounded flap.

Spinous dorsal wanting, the soft dorsal short, inserted on the tail. Anal similar to the dorsal in shape, inserted a little behind it. Pectoral $1\frac{2}{5}$ in head; the lower part of its base extends far forward below. Ventral disk nearly round, with a broad, free margin, its longitudinal diameter contained about $1\frac{1}{5}$ times in head, its center on a perpendicular passing about midway between eye and gill opening.

Color dark olive, with numerous small, round, black dots on the upper parts. Posteriorly the dots coalesce forming indistinct, irregular, narrow bands or reticulations.

Described from an example from Aomori, 170 millimeters long exclusive of the caudal fin which is broken. The specimen was presented by Mr. Sotaro Saito. Of 2 specimens from the Pribilof Islands, 1 has very small spots scarcely distinguishable from the general dark color; the other is similar in color to the Japanese example.

Bering Sea and southward to northern Japan.

Family II. LIPARIDIDÆ.

THE SEA SNAILS.

Body more or less elongate, tadpole-shaped, subcylindrical anteriorly, compressed behind, the head depressed; both head and body covered with smooth, thin skin, which is very lax. Head broad, obtuse, the snout short, wide, and blunt; third suborbital bone styliform behind, forming a bony stay articulating with the preopercle, as in *Cottidæ*; mouth moderate, anterior, terminal, the jaws equal, or the lower included; jaws with bands of small teeth, which are simple or more or less tricuspid, usually close set, forming a pavement; no teeth on vomer or palatines; premaxillaries protractile, little movable; opercular bones unarmed; interopercle slender, ray-like, overlying the branchiostegals; gill openings small, the membranes joined to the broad isthmus and to the humeral arch below. Branchiostegals 6. Gills $3\frac{1}{2}$, no slit behind the last; pseudobranchiæ small or wanting; dorsal fin rather long, the spines feeble and flexible, low, similar to the soft rays; anal long, similar to the soft dorsal; ventral fins I, 5, the two completely united and forming the bony center of an oval sucking disk, or else sometimes entirely wanting; pectoral fin very broad, the base procurrent, extending forward under the throat, the outline usually emarginate, some of the lower rays being produced; tail diphyccercal; caudal fin short, convex; vertebrae numerous, 35 to 50; pyloric cæca numerous; no air bladder; stomach siphonal, U-shaped, intestine elongate. Small, sluggish fishes, nearly all of the Arctic seas, a few belonging to the Antarctic; found adhering to rocks at various depths. The group is evidently closely allied to the *Cottidæ*, and its origin must be sought in the ancestors of such types as *Psychrolutes* and *Cottunculus*, the *Cyclopteridæ* representing a coordinate phase of degradation.

LIPARIDINÆ.

- a. Ventral disk present, large or small.
- b. Ventral disk normal, composed of 13 lobes, a median one in front and one corresponding to each of the fin rays, each lobe with a deciduous horny covering or papilla. Teeth close set in pavement-like bands, tricuspid in the young, some or all becoming angular or bluntly arrow-shaped in the adult; caudal fin well developed, rather broad.
- c. Dorsal fin continuous, the spines not separated from the soft rays.
- d. Nostrils, 2 on each side, the posterior in a more or less distinct tube.
- e. Tip of snout without barbels. *Liparis*, 3.
- ef. Tip of snout with several barbels or tubular projections; substance of body translucent. *Crystallias*, 4.

3. LIPARIS (Artedi) Scopoli.

SEA SNAILS.

- Liparis* ARTEDI, Genera, 1738, p. 117 (nonbinomial).
Cyclogaster GRONOW, Museum, 1763, p. 157, (nonbinomial).
Liparis SCOPOLI, Introd. Hist. Nat., 1777, p. 453 (*liparis*).
Liparis CUVIER, Règne Anim., 1st ed. 1817 (*liparis*; not *Liparis* Ochseneimer, 1810, a genus of *Lepidoptera*).
Cyclogaster GRONOW, Cat. Fishes, Gray ed., 1854, p. 40 (*liparis*; not of Macquart, 1854, a genus of flies).
Actinochir GILL, Proc. Ac. Nat. Sci. Phila., 1864, p. 193 (*major*).
Careliparis GARMAN, Discoboli, 1892, p. 56 (*agassizii*).
Lipoliparis JORDAN and EVERMANN, Check-List Fishes, 1896, p. 451 (*pulchellus*).

Body rather elongate, covered with smooth skin, which is usually freely movable; head short, flattened above; mouth horizontal, the jaws equal or the lower jaw included; teeth in several series, close set, always more or less tricuspid, the adult with the outer cusps often worn or obliterated; maxillary covered by skin of preorbital region; anterior nostrils present, tubular or not; posterior nostrils usually tubular, no barbels or tubes at tip of snout, ventral disk well developed on the breast, its front below or behind the middle of the head, its surface with 13 lobes; an anterior median lobe, and 1 corresponding to each of the 6 rays in each fin; each lobe with a horny papilla covering, which is sometimes lost; vent well behind the head, about midway between the sucking disk and anal fin; dorsal fin continuous, undivided, its spines not differentiated; caudal well developed; dorsal fin free from caudal or joined; pectoral broad, procurent at base, emarginate and free at tips, some of the lower rays produced; vertical fins enveloped in the lax skin; vertebrae 35 to 55. Northern seas near the shores; the species less arctic in distribution and in general inhabiting shallower water than is the case with *Careproctus* and *Paraliparis*, a fact associated with the reduced number of vertebrae in *Liparis*. The species are numerous, but in general well defined, their characters varying with age. In most of the species color varieties occur, several (*pulchellus*, *liparis*, *aleuticus*, *agassizii*) having the body often marked everywhere with concentric curved stripes or rings. (λιπαρός, sleek-skinned.)

3. LIPARIS AGASSIZII Putnam.

- Cyclopterus liparis* BLOCH, Ausländ. Fische, I, 1785, p. 48, in part; Pacific specimens.
Liparis agassizii PUTNAM, Proc. Amer. Assoc. Adv. Sci., 1874, p. 339; Sakhalin, Channel of Tartary (Coll. Pierce and Smith).—GARMAN, Discoboli, p. 62, 1892, pls. I-III.—JORDAN and EVERMANN, Fish. North and Middle Amer., II, 1898, p. 2121; Bristol Bay, Alaska.—JORDAN and GILBERT, Fish. Bering Sea, III, p. 473; Bristol Bay.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 369; Hakodate.
Liparis gibbus BEAN, Proc. U. S. Nat. Mus., 1881, p. 148; Unalaska, St. Paul Island, Indian Point, Cape Chaplin, and Plover Bay, Siberia.—JORDAN and GILBERT, Synopsis, 1883, p. 741.
Liparis ? *pulchellus* ISHIKAWA, Prel. Cat., 1897, pp. 36-37; Hakodate, Sakhalin.

Head $3\frac{1}{2}$ in length; depth 4; length of snout $3\frac{1}{5}$ in head; diameter of eye $7\frac{1}{2}$; width of interorbital space 3; D. 44; A. 34; P. 34.

Body elongate, compressed posteriorly, about as wide as deep anteriorly. Head large, interorbital space broad and flat. Mouth large, the maxillary extending nearly to middle of eye; lower jaw included; teeth tricuspid, in oblique rows, forming broad bands on the jaws. Anterior nostril with a large tube, the posterior with a low rim. Gill opening extending a short distance below upper edge of base of pectoral, its width contained 3 times in head.

Dorsal and anal fins enveloped in loose skin and gelatinous tissue, the anterior rays hidden from view; dorsal inserted above posterior edge of ventral disk, its distance from tip of snout about 3 in body; anal inserted farther back, its distance from snout about 2 in body; both dorsal and anal joined to the caudal, the tips of the posterior rays separated by a shallow notch. Posterior edge of pectoral rounded, 4 or 5 of the lower rays elongate, their free tips extending beyond margin of fin; length of pectoral about 5 in head. Ventral disk nearly round, with a broad, free border, its diameter contained about $2\frac{1}{4}$ times in head.

Skin smooth; distinct pores on upper jaw, no barbels.

Color in spirits pale brownish with dark markings. The color varies considerably; some specimens are almost translucent, the sides with dusky clouds, the fins edged with blackish; other individuals have irregularly shaped, dark spots on the sides or dusky vertical bands beginning near median line and extending to edge of dorsal fin; an example from Hakodate has many narrow purple bands extending from snout to caudal fin.

North Pacific; common south to Unalaska on the American side and to Myiako in Rikuchu on the Japanese. It is especially abundant about rocks around Hakodate Head. Our numerous Japanese specimens are from Otaru, Hakodate, Aomori, and Myiako. The original types were collected by Messrs. Pierce and Smith at Sakhalin, Channel of Tartary.

(Named for Prof. Louis Agassiz.)

4. CRYSTALLIAS Jordan and Snyder, new genus.

Crystallias JORDAN and SNYDER, new genus (*matsushimæ*).

Allied to *Liparis*, differing in the diaphanous body which is strongly compressed, and especially in the possession of a number of barbels on the jaws. The presence of barbels distinguishes it from *Crystallichthys*, which it very closely resembles.

(κρυστάλλος, crystal.)

4. *CRYSTALLIAS MATSUSHIMÆ* Jordan and Snyder, new species.

Head $4\frac{1}{3}$ in length; depth $4\frac{1}{6}$; snout $3\frac{1}{4}$ in head; eye $3\frac{1}{2}$; interorbital space $2\frac{3}{4}$; D. 58; A. 51; P. about 31.

Body and head markedly compressed; upper profile of head rather abrupt in front; mouth inferior, oblique; the maxillary extends to a point below anterior part of iris. Teeth small, trilobed; the lateral lobes minute, larger on posterior teeth, scarcely discernible or absent on anterior ones. Eye large, directed laterally, situated a little nearer to tip of snout than to gill opening. Snout apparently without pores; three or more small, fleshy barbels on each side of upper and lower jaws; those on upper jaw slightly longer than those below, both groups located on the part of jaw anterior to angle of mouth. Nostral single, with a large tube located in the position occupied by the anterior nostril in *Liparis*. Gill opening small, entirely above base of pectoral fin. No lateral line can be detected.

Fin rays enveloped in a gelatinous, fleshy covering which grows thinner posteriorly where the rays are more exposed to view. Dorsal fin beginning just above gill opening, the rays growing gradually

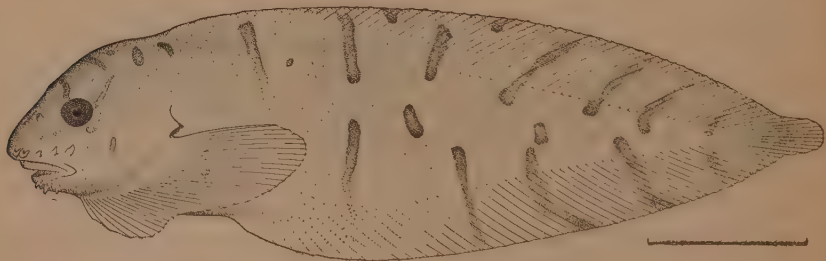


FIG. 2.—*CRYSTALLIAS MATSUSHIMÆ*.

higher posteriorly to near the caudal fin, where they become shorter; anal inserted behind beginning of dorsal, a distance equal to one-half the length of head, similar in shape to dorsal; both dorsal and anal continuous with caudal, the latter rounded posteriorly. Pectoral large, its edge divided by a shallow notch, the two parts thus separated being broadly rounded; the fin extends forward below to the anterior middle portion of ventral disk. Ventral disk small, round; its edge free.

Color translucent; head and body with narrow dark bars and oblong spots. The bars, 7 to 8 above, 5 below, have their origins near median line of body, where they are darkest and better defined; passing outward they become less distinct and disappear near edges of fins. A row of 4 or 5 spots on upper edge of fin, 2 spots near middle of body, several spots and bars on upper part of head.

The species is represented by a single specimen 120 millimeters long, in a bad state of preservation, the skin in many places torn from the body. It is not evident whether the posterior border of the pectoral is entire or notched, or whether the dorsal and anal are partly separated from the caudal.

Type.—No. 49802, U.S.N.M., collected by the United States Fish Commission steamer *Albatross* in the Bay of Matsushima, station 3773, at a depth of 78 fathoms.

(*Matsu*, pine; *shima*, island.)

Supplementary note.—In the Museum of Hakodate is another species of *Liparididae*, called Kokkoda, from Kayabe in Hokkaido. It is probably a species of *Neoliparis* Steindachner, a genus distinguished from *Liparis* by the separation of the dorsal spines from the soft rays by a notch.

The specimen examined was $4\frac{1}{2}$ inches long: D. about VI, 30; P. about 24. Disk round, $1\frac{2}{3}$ in head. Gill opening extending downward to base of uppermost pectoral ray; nostrils all similar, each with a raised rim. Dorsal free from caudal; anal slightly connected. Body very limp, pale in color. The species is allied to the Californian *Neoliparis mucosus*. It is to be hoped that some Japanese naturalist may find and describe this species.

A REVIEW OF THE JAPANESE SPECIES OF SURF-FISHES OR EMBIOTOCIDÆ.

By DAVID STARR JORDAN (assisted by MICHITARO SINDO),

Of the Leland Stanford Junior University.

In this paper is given an account of the surf-fishes or Embiotocidæ, constituting the suborder of Holconoti, which are known to inhabit the waters of Japan. The family is confined mainly to the shores of California, where 14 genera and 22 species have been described. The few species in Japan are evidently an overflow from this characteristic Californian fauna, and are interesting as completing the series of known species of the group. They are known to fishermen by the name of *Tunago*. The species mentioned are preserved in the United States National Museum.

Suborder HOLCONOTI.

The singular family of Embiotocidæ appears to constitute a distinct group or suborder allied to the Percoidea on the one hand and to the Pharyngognathi on the other, but without very close affinities with either. The structures connected with the viviparous habit, the united pharyngeals, the increased number of vertebræ, the double nostrils, the perfect gills, and the presence of many rays in the soft dorsal and anal, together with the unarmed bones of the head, constitute the chief characters of the Holconoti.

(ὄλκος, groove; νᾶτος, back.)

Family EMBIOTOCIDÆ.

THE SURF-FISHES.

Body ovate or oblong, compressed, covered with cycloid scales of moderate size. Cheeks, operculum, and interoperculum scaly; lateral line continuous, running high, without abrupt flexure, not extending on the caudal fin; head rather short; mouth small, terminal; jaws with conical or compressed teeth of moderate or small size, in 1 or 2 series; rarely wanting; no teeth on vomer or palatines; no canines; lower pharyngeals united without suture, their teeth conical or paved; upper

jaw freely protractile; lips full, the lower either forming a free border to the jaw or else attached by a frenum at the symphysis; maxillary short, without supplemental bone, slipping for most or all of its length under the preorbital; opercular bones entire; branchiostegals, 6 (or 5); gill rakers usually slender; gill openings wide, the membranes free from the isthmus or very slightly connected; pseudobranchiæ present; gills 4, a slit behind the fourth; nostrils round; the openings, 2 on each side; dorsal fin single, long, with 8 to 18 usually slender spines, which are depressible in a groove; a sheath of scales along the base of the anterior part of soft dorsal and posterior of spinous dorsal, this sheath separated by a furrow from the scales of the body; anal fin elongate, with 3 moderate or small spines and 15 to 35 slender soft rays, its form and structure differing in the two sexes; ventral fins thoracic, 1, 5; pectorals moderate; caudal forked; oviduct opening behind the vent, the two apertures always distinctly separated: air bladder large, simple; no pyloric cæca; vertebræ 13 to 19, 19 to 23, 32 to 42. Viviparous. The young are hatched within the body, where they remain closely packed in a sac-like enlargement of the oviduct analogous to the uterus until born. These foetal fishes bear at first little resemblance to the parent, being closely compressed and having the vertical fins exceedingly elevated. At birth they are from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches in length and similar to the adult in appearance, but more compressed and red in color. Since the announcement of their viviparous nature by Prof. Louis Agassiz in 1853 and by Dr. William P. Gibbons in 1854 these fishes have been objects of special interest to zoologists. One species (*Hysterocarpus traski*) inhabits fresh water; one species (*Zalemibus rosaceus*) descends to considerable depths. These species reach a length of from 6 to 18 inches and are very abundant where found. They are much used for food, but the flesh is comparatively poor, tasteless, and bony. Most of them feed on crustacea, but one genus (*Abeona*) is partly or wholly herbivorous. The species mostly live in the surf along sandy beaches and are confined to California and Japan, their origin being evidently Californian. The two Japanese species are of separate Californian origin, *Ditrema* being descended from ancestors of *Phanerodon* and *Embiotoca*, while *Neoditrema* must have sprung from ancestors of *Hypocritichthys* and *Hyperprosepon*.

- a. EMBIOTOCINÆ. Spinous dorsal shorter than soft dorsal, of 6 to 11 spines; anal spines graduated; marine species.
- b. Scales relatively small, 60 to 70 in lateral line.
- c. Gill rakers numerous, long and slender, about 25 below angle of arch; lower lip without frenum; profile of head depressed above eye; mouth oblique; short; lower pharyngeals small.
- d. Males with one row of teeth in upper jaw, the lower with few or none; females with toothless jaws..... *Neoditrema*.
- cc. Gill rakers few, small, about 15 below angle; lower lip with a frenum; mouth with teeth in one series; sexes similar; lower pharyngeals rather slender, with small teeth..... *Ditrema*.

NEODITREMA Steindachner.

Neoditrema STEINDACHNER, Beitr. Kenntn. Fische Japans, II, 1883, p. 32 (*ransonneti*).

Body elongate, compressed, with rather long caudal peduncle; frontal region depressed above eyes. Mouth small, the lower jaw projecting; dentition unlike in the two sexes; females without teeth in the jaws; males with one row of bluntish teeth above, these wide set and turned forward in a line with direction of edge of premaxillary bone, the lateral teeth largest; lower lip thin, without frenum; gill rakers close set, long and slender, about 25 below angle of arch; lower pharyngeals small, with small teeth; scales small, deciduous, about 70 in the lateral line; dorsal fin low, rather short; anal low, rather short, much distorted in the male; abdomen shorter than anal fin.

One species known, a small fish closely allied to the American genus, *Hypocritichthys*, from which it differs in the dentition. From *Ditrema*, both genera are separated by the long and slender gill rakers, the depressed frontal region, and the free lower lip.

(*νεός*, new; *Ditrema*.)

NEODITREMA RANSONNETI Steindachner.

NE, OKITANAGO (OFFSHORE SURF-FISH).

Neoditrema ransonneti STEINDACHNER, Fische Japans, II, 1883, p. 32; Yokohama.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1901, p. 752; Tsushima Island, Straits of Korea.

Head, $3\frac{1}{2}$ to $3\frac{3}{4}$ in length; depth, 3 to $3\frac{1}{2}$. D. VI to VIII, 20 to 22. A. III, 26 or 27. Scales, 6—70 to 72—14 to 16. Eye, $3\frac{1}{4}$ to $3\frac{3}{8}$ in head; interorbital, $3\frac{1}{2}$ to 4; snout, 4; maxillary, $3\frac{1}{4}$. Body strongly compressed, the nape and breast especially so; profile above eyes strongly concave; mouth oblique, the chin projecting; lower lip thin, without frenum; eye rather large; gill rakers close set, long and slender, 20 to 25 below angle; spinous dorsal low, the spines slender; soft dorsal low; caudal peduncle moderate, the fin well forked, $1\frac{1}{2}$ in head; pectorals, $1\frac{1}{2}$ in head; ventrals somewhat shorter; $3\frac{1}{2}$ to 4 rows of scales on cheek. The males have teeth in the upper jaw, sparse, bluntish, wide set, in one row, directed forward in line with edge of the bone, those on sides of mouth largest; lower jaw usually with two or three small teeth in front; females toothless. Color, dark olive brown above, the lower parts coppery or golden, with traces of faint dark streaks along the rows of scales; chin dusky; a dusky spot on upper part of opercle; no spots on preopercle or snout. Males with a jet black spot on the premaxillary, which is wanting in the females; fins dusky yellowish; the anal and dorsal black in front, the ventrals black at tip; a dark streak across base of pectoral.

This little fish is known to us from upward of a hundred examples

of both sexes taken by us in Koajiro Bay, near Misaki, where the species is locally very abundant. It has not been seen elsewhere save on the island of Okishima in the Japan Sea, whence one male example was received from Dr. K. Kishinouye, and from the island of Tsushima in the Korean Straits, where one female example was taken by Mr.

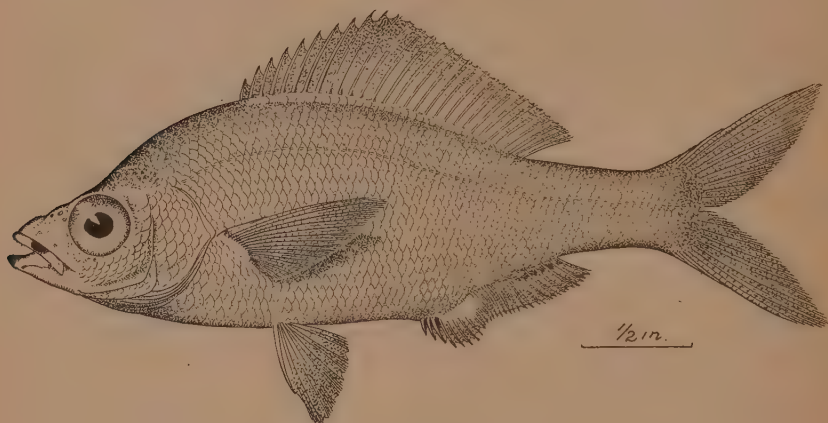


FIG. 1.—NEODITREMA RANSONNETI.

P. L. Jouy. The original types, female, found by Baron Ransonnet in the market of Yokohama, doubtless came from Misaki. The native name at Okishima is *Ne*. At Misaki it is called Okitanago, or offshore surf-fish. The largest example (from Okishima) is but 100 mm. long.

Measurements of Neoditrema ransonneti.

Length in millimeters.....	100
Head in hundredths of length.....	28
Depth.....	31
Snout to dorsal.....	36
Snout to anal.....	61
Depth of caudal peduncle.....	11
Snout.....	7
Eye.....	9
Tip of snout to end of maxillary.....	9
Width of interorbital space.....	7½
Length of dorsal fin.....	41
Length of anal fin.....	22
Height of longest dorsal spine.....	11
Height of longest dorsal ray.....	16½
Height of longest anal spine.....	6
Height of longest anal ray.....	7
Length of pectoral fin.....	25
Length of caudal fin.....	28
Length of ventral fin.....	19½
Number of scales.....	6-72-16
Number of dorsal rays.....	VII, 20
Number of anal rays.....	III, 20
Number of pectoral rays.....	I, 19
Locality.....	Oki Island

DITREMA Schlegel.

Ditrema SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 77, pl. XL, fig. 2 (*temminckii*).

Body oblong, more or less elevated, somewhat compressed, the caudal peduncle robust. Head moderate, the jaw included. Lips moderate, the lower attached by a frenum at the chin. Maxillary short,

its whole length slipping under the preorbital. Teeth few, conical, bluntish, in one series. Gill rakers weak, rather short and slender. Pharyngeals normal, the anterior and lateral teeth small, conic, none of them especially enlarged; males with a gland on some of the anterior anal rays, but none of them modified to form a definite plate. Vertebrae 14 + 18 or 19, the base of anal below 9 caudal vertebrae; first hæmal spine small, applied to the second. Caudal fin lunate; anal fin rather long, much longer than abdomen, its spines small. Scales small, 60 to 80 in the lateral line. This genus is close to the American genus *Embiotoca*, the most generalized and perhaps the most primitive genus of the family. The only difference of importance is the slight one of the coarser and blunter teeth of *Embiotoca*.

(*δῖς*, two; *τρῆμα*, aperture, the generative organs in all *Embiotocidæ* having a distinct opening from the intestines.)

DITREMA TEMMINCKI Bleeker.

UMI-TANAGO (SEA SURF-FISH); AKATANAGO (RED SURF-FISH).

Ditrema SCHLEGEL, Fauna Japonica, 1846, p. 77, pl. XL, fig. 2; Nagasaki.

Ditrema temmincki BLEEKER, Verh. Bat. Gen., XXV, Japan, p. 33; Nagasaki.—GÜNTHER, Cat. Fish., IV, 1862, p. 246.—STEINDACHNER and DÜDERLEIN, Fische Japans, II, 1883, p. 31; Tokyo, Yokohama.—ISHIKAWA, Prel. Cat., 1897, p. 27; Hokkaido, Tokyo, Fukushima.—JORDAN and EVERMANN, Fish. N. and M. Amer., II, 1898, p. 1510; Tokyo.

Ditrema læve GÜNTHER, Cat. Fish., II, 1860, p. 392; Japan.—NYSTROM, Kong. Svensk. Vet. Akad., 1887, p. 32; Nagasaki.

*Ditrema smitti*¹ NYSTROM, Kong. Svensk. Vet. Akad., 1887, p. 32; Nagasaki (adult example).

Embiotoca smitti JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 358; Yokohama, Coll. *Albatross*.

D. X, 21; A. III, 26. Scales, 11—75—19. Head measured, exclusive of opercular flap, $3\frac{1}{2}$ in length, exclusive of caudal fin; depth, $2\frac{1}{3}$. Snout, $3\frac{1}{8}$ in head; eye equal to snout; interorbital space, 3; caudal fin, 1 in head; pectoral, $1\frac{1}{10}$; ventral, $1\frac{5}{8}$; the longest dorsal spine, 3; longest dorsal ray, the fifth, $1\frac{2}{3}$; third anal spine, $5\frac{1}{4}$; the longest anal ray, the ninth from the last, equal to the pectoral; depth of caudal peduncle, 2.

Body ovate, compressed, the nape somewhat prominent; nasal bone slightly prominent; ventral outline from throat to vent almost straight. Mouth small, maxillary nearly equal to snout; lower jaw slightly included; teeth conical, blunt, in a single series, on the front of lower

¹*Ditrema smitti* is described as having the head 4 in total length with caudal, the depth nearly 3, D. XI, 21, A. III, 27. Scales, 11—78—18; spinous dorsal black with a narrow line of the same color at the base of the soft rays. Pectorals yellowish, and with black tips, the first ray with a black spot at base. Preopercle with a blackish spot on the lower limb and a larger one behind it. Length, 180 mm. This is certainly the adult of the species, of which a rather faded young specimen was first described as *Ditrema*.

jaw only, those on upper jaw pointing more outward than downward. Nostrils small, posterior ones slightly larger. Gill rakers short and slender, anteriorly inclined, about 15 on lower limb of arch; 5 rows of scales on cheek. Mandibles and edge of opercle naked. Scales below lateral line on middle of body largest, their depth being greater than the length. Fins naked, the dorsal with a scaly sheath. Pectoral fins pointed behind, the upper rays longest, graduated, the tip reaching to vent. Ventral fins inserted below the second dorsal spine, their tips not reaching to that of the pectorals. Dorsal spines shorter than the soft rays, the last the longest; soft dorsal highest in front; anal spines small, the third the longest, much shorter than the soft rays, in male seventh to tenth soft anal rays from the last prolonged almost equal to the length of pectoral fin, graduated posteriorly; males with the anal considerably depressed in front with a glandular appendage, the soft rays sometimes considerably produced; caudal widely forked.

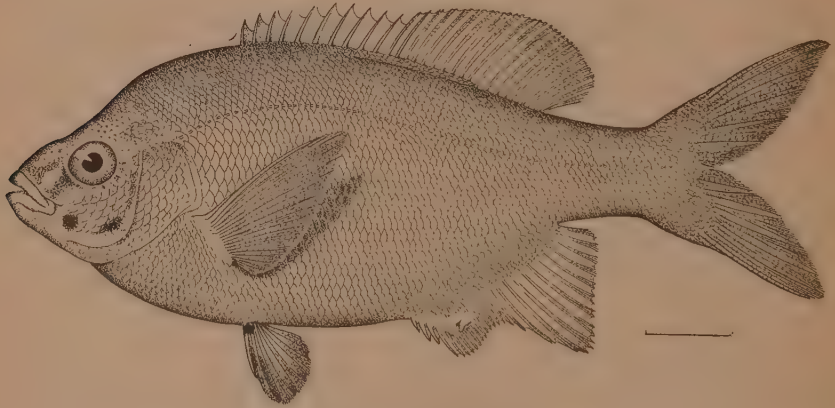


FIG. 2.—DITREMA TEMMINCKI.

Color silvery, steel blue on back: lower limb of preopercle with a black spot in front and another at the angle, these very rarely obsolete; two black bars from eye toward maxillary, a dark blotch on upper end of opercle; upper half of spinous dorsal black; soft fin uncolored, or with a dark edge; anal and caudal fins dusky; pectorals uncolored, axil slightly dusky; tips of ventrals dark, with the first rays and the membrane between the fourth and fifth rays chalky white. The ground coloration is subject to considerable variation, but the two spots below the eye and the two stripes on snout are rarely absent.

Here described from a specimen $8\frac{1}{2}$ inches long from Tokyo. Our numerous specimens were collected by Jordan and Snyder at Nagasaki, Hakata, Onomichi, Kobe, Wakanoura, Misaki, Tokyo, Same, Aomori, and Hakodate. The specimen from Hakata is the type of the accompanying figure.

Those from Misaki, obtained in rather deeper water than the others, were distinctly of a coppery red in life, with a redder line running laterally forming the chord to the arc of the curved lateral line. These were locally called *Aka-tanago* (red surf-fish). The majority of these red specimens have their dorsal spines reduced to 7 or 8, but some have 9; the body is rather more roundish than in those from other localities, the fins dusky with a slender black bar running at the base of the dorsal and anal fins; the lips are dusky. We do not, however, regard them as forming a distinct species. One specimen from Hakata has the body and fins except the pectorals blackish dusky, with the spinous dorsal uncolored, and the body considerably thicker than in the others. Many specimens have a black spot at the pectoral axil, and the ventral fins are often black from root to end; a black bar running along the root of dorsal and anal fins; the vertical fins higher, the eyes larger and the head longer in young specimens than in the adult. All these peculiarities seem to depend upon the character of the water or of the bottom and are within the range of specific variation.

(Named for Prof. C. J. Temminck, the associate of Professor Schlegel.)

Measurements of Ditrema temmincki.

Locality.	Nagasaki.	Misaki.	Tokyo.	Hakodate.
Length in millimeters	149	105	172	191
Head in body	28	31	29	29½
Depth	45½	45	45	47
Snout to dorsal	39	42	40	41
Snout to anal	59	59	62	64
Depth of caudal peduncle	13	13	14	14
Snout	9	9½	9	10
Eye	9	9½	8	8½
Tip of snout to end of maxillary	8	7½	8½	8½
Width of interorbital space	9	8½	9½	9½
Length of dorsal fin	51	45	49½	50½
Length of anal fin	27	28	27	25
Height of longest dorsal spine	8½	10½	9½	8
Height of longest dorsal ray	14½	13	17	17
Height of longest anal spine	4½	6	6	5
Height of longest anal ray	22½	12	15	22½
Length of pectoral fin	25	25	25	26
Length of caudal fin	29	27	30	30
Length of ventral fin	16	17	16½	15
Number of dorsal rays	X, 20	IX, 21	X, 20	X, 21
Number of anal rays	III, 26	III, 26	III, 26	III, 25
Number of pectoral rays	I, 19	I, 19	I, 19	I, 19
Scales above lateral line	10	11	10	10
Scales on lateral line	75	71 to 74	76	77
Scales below lateral line	19-20	21	19-20	19-20

A REVIEW OF THE PEDICULATE FISHES OR ANGLERS OF JAPAN.

By DAVID STARR JORDAN (assisted by MICHITARO SINDO),
Of the Leland Stanford Junior University.

In the present paper is given an account of the species of *Pediculati*, or Angler-fishes, known to inhabit the waters of Japan. With other papers of this series it is based on the collections made by Messrs. Jordan and Snyder in 1900, under the auspices of the Hopkins Seaside Laboratory of Leland Stanford Junior University, a duplicate series being deposited in the United States National Museum, and upon specimens collected by the United States Fish Commission steamer *Albatross*.

Order PEDICULATI.

THE PEDICULATE FISHES.

Carpal bones notably elongate, forming a kind of arm (pseudobrachium) which supports the broad pectoral. Gill opening reduced to a large or small foramen situated in or near the axil, more or less posterior to the pectorals. Ventral fins jugular if present; anterior dorsal reduced to a few tentacle-like, isolated spines; soft dorsal and anal short; no scales. First vertebra united to cranium by a suture; epiotics united behind supraoccipital; elongate basal pectoral radii (actinosts, reduced in number; no interclavicles; post temporal broad, flat, simple; upper pharyngeals 2, similar, spatulate, with anterior stem and transverse blade; basis of cranium simple; no air duct to the swim bladder. Marine fishes, chiefly of the tropics and the oceanic abysses. The group is an offshoot from the Acanthopteri, its chief modification being in the elongation of the actinosts and in the position of the gill opening. The Batrachoididæ are perhaps its nearest relatives.

(*Pediculatus*, having a foot-stalk.)

Analysis of families of Japanese Pediculati.

- a. Gill openings in or behind the lower axil of the pectoral; mouth large, terminal.
- b. Pseudobranchiæ present; base of pectoral with two actinosts; head broad, depressed, the enormous mouth with very strong teeth; ventrals large.
 - LOPHIIDÆ, I.
- bb. Pseudobranchiæ none; base of pectoral with 3 actinosts.
- c. Ventrals present; the arm angulate, pseudobranchia elongate.
 - ANTENNARIIDÆ, II.
- aa. Gill openings in or behind upper axil of pectoral; mouth small, inferior; skin with warts or prickles..... OGCOCEPHALIDÆ, III.

Family I. LOPHIIDÆ.

THE ANGLERS.

Head wide, depressed, very large. Body contracted, conical, tapering rapidly backward from the shoulders. Mouth exceedingly large, terminal, opening into an enormous stomach; upper jaw contractile; maxillary without supplementary bone; lower jaw projecting; both jaws with very strong, unequal, cardiform teeth, some of teeth canine-like, most of them depressible; vomer and palatines usually with strong teeth. Gill openings comparatively large, in lower axil of the pectorals. Pseudobranchiæ present. Gill rakers none; gills 3. Skin mostly smooth, naked, with many dermal flaps about the head. Spinous dorsal of 3 isolated, tentacle-like spines on head and 3 smaller ones behind, which form a continuous fin; second dorsal moderate, similar to the anal; pectoral members scarcely geniculated, each with two actinosts and with elongated pseudobranchia; ventrals jugular, I, 5, widely separated, large, much enlarged in the young. Young with the head spinous. Pyloric cæca present.

Fishes of the sea bottom, living at moderate depths, remarkable for their great voracity.

- a. Vertebrae reduced in number, 18 to 20 in all *Lophiomus*, I.

1. LOPHIOMUS Gill.

Lophiomus GILL, Proc. U. S. Nat. Mus., V, 1882, p. 552 (*setigerus*).

This genus includes those species of Lophiidae which have the vertebrae reduced in number, 18 or 19, instead of about 30, as in *Lophius*, a fact associated with their tropical distribution. The species inhabit the Pacific, those of *Lophius* being found in the Atlantic.

(*Lophius*: ὤμος, shoulder, in allusion to the trifold humeral spine.)

- a. First dorsal spine higher than second; ventral fins pale; inside of mouth anteriorly black, with pale spots; peritoneum blackish; head less than half length.
 - setigerus*, 1.
- aa. First dorsal spine not higher than second; ventral fins black on the inner side; inside of mouth unmarked; peritoneum pale; head not less than half length.
 - litulon*, 2.

1. *LOPHIOMUS SETIGERUS* (Vahl).

ANKO.

Lophius setigerus VAHL, Skrivt. Naturh., IV, 1797, p. 214, pl. III, figs. 5, 6; China Sea.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., XII, 1837, p. 383, after Vahl and a Japanese drawing.—GÜNTHER, Cat. Fish., III, 1861, p. 180; Japan (not *Lophiomus setigerus* Gilbert and of Jordan and Evermann, an American species, *Lophiomus caulinaris* Garman, from the Galapagos).

Lophius viviparus SCHNEIDER, Syst. Ichth., 1801, p. 142, pl. XXXII, after Vahl.

Head, measured to the anterior edge of gill opening, $2\frac{2}{3}$ in length of body without caudal; width, 2 in head; width of mouth, $3\frac{1}{5}$; snout, $9\frac{1}{4}$ in total length, or $1\frac{1}{5}$ in interorbital space; eye, $2\frac{1}{2}$ in snout; D. IV + II, 9; A. 7; P. 22; V. 7; caudal fin, $4\frac{1}{2}$; pectoral fin, 6; first dorsal spine, $4\frac{2}{3}$ in length, with a simple slender flap on end, placed on the edge of receding lip; second spine $1\frac{1}{2}$ to $1\frac{2}{3}$ in the first, standing very closely behind the latter; enveloped in filamentous skinny fold; third spine inserted under tip of the depressed second spine, slender and bony as the first spine, but tapering to a fine point without a filament; its proximal end concealed; fourth spine beginning on cross line from the tip of humeral spine to the other, and of exactly the same structure as the third, but in some cases a little shorter; two very short spines similar to the second spine placed close together half way between the fourth spine, and dorsal fin; rays of soft dorsal nearly equal in height, except the first and last, which are somewhat shorter than the rest, their free tips projecting; numerous spines on head, those at the tip of snout and on the ridge above eye, at the angle of mouth, and the region of occiput being most prominent, especially in young specimen; humeral spine trifid, with a minor branch near its root, the posterior branch longest and usually bifid, pointing backward; the spine thus ends in five points; long filaments along jaw, angle of mouth, and side of body; small ones all over dorsal side of body and fins; one specimen from Nagasaki has also two tentacles on snout developed into two knob-like processes. Ventral side free from filaments; teeth on mandible in alternate rows, those in the inner row being longest and pointing inward; all except a few on outermost row near the angle depressible; teeth in maxillary also very irregular in height and arrangement; those on outermost row short and pointing outward and generally depressible, those near the angle inward; those on inner rows inclining inward and nearly all depressible.

Color of body gray to grayish brown, with numerous lighter dots with black border. The specimens from Nagasaki are more grayish than brownish, with numerous minute black dots on back of head, body, and spines; small filaments generally black; four black filaments equally distributed in a row on caudal fin near the end; dorsal fin marbled with blackish markings; pectoral fins darker than head; ventral side white; ventral fins pale, unmarked, sometimes a dusky shade

on lower side of pectoral and around vent; peritoneum black; inside of mouth anteriorly black, with round yellowish spots.

Coasts of southern Japan, rather common; our specimens from Wak-anoura and Nagasaki. This species is evidently identical with Vahl's original figure as copied by Schneider.

(*Setiger*, bristle-bearing.)

Measurements of Lophiomus setigerus.

Locality.	Nagasaki.	Nagasaki.
Length in millimeters without caudal.....	238.	175
Dorsal rays.....	IV-II, 9	IV-II, 9
Caudal ray.....	8	8
Anal rays.....	7	7
Pectoral rays.....	23	22
Ventral rays.....	5	5
Head in hundredth of length without caudal.....	55	57
Width of head.....	60	66
Width of body close to gill opening.....	22	27
Depth of caudal peduncle.....	5	5
Length of tail.....	35	35
Snout.....	14	17
Length of maxillary.....	20	22½
Intermaxillary space.....	8	8
Diameter of eye.....	7	7
Interorbital space.....	11½	12
Snout to tip of humeral spine.....	45	47
Distance between tips of humeral spine.....	40	41
Snout to first dorsal spine.....	4	5
Height of first dorsal spine.....	27	26
Snout to second dorsal spine.....	6	7
Height of second dorsal spine.....	15	16
Snout to third dorsal spine.....	24	26
Height of third dorsal spine.....	21½	23
Snout to fourth dorsal spine.....	38	37
Height of fourth dorsal spine.....	21	20
Snout to dorsal fin.....	60	58
Length of base of dorsal fin.....	30	25
Height of dorsal ray.....	20	20
Length of caudal ray.....	25	25
Height of anal fin.....	17	18
Length of pectoral fin.....	20	23
Length of ventral fin.....	14	14
Ventral fin to vent.....	43	41
Vent to anal fin.....	6	5½

2. *LOPHIOMUS LITULON* Jordan, new species.

Lophius setigerus ISHIKAWA, Prel. Cat., 1897, p. 36; Boshu (not of Vahl).

Lophiomus setigerus JORDAN and SNYDER, Proc. U. S. Nat. Mus., XXIII, 1900, p. 380; Tokyo.

Head of the type specimen, measured to gill opening, 2 in length to base of caudal; its width equal to its length; snout, $6\frac{2}{3}$ in head; eye, $2\frac{1}{2}$ in snout; length of maxillary, 5 in head; space between maxillaries, $2\frac{1}{2}$ in maxillary; interorbital space, 8 in length of body; snout to tip of humeral spine, $2\frac{1}{2}$; distance between tips of opposing humeral spines, $2\frac{3}{4}$; D. IV-11 9; A. 8; C. 8; P. 23; V. 5; width of body close to gill opening, $5\frac{1}{4}$, being a little more than its depth; length of tail, 3; depth of caudal peduncle, 2 in snout; base of dorsal fin, 3; its height, $5\frac{5}{8}$; base of anal fin, $4\frac{1}{2}$, height, $4\frac{3}{8}$; caudal fin, 4; pectoral fin, $4\frac{1}{2}$; ventral fin, $6\frac{1}{4}$.

First dorsal spine lower than the second, its height being equal to snout, with rather stout, simple tentacle. Second dorsal spine thinly

concealed in a scantily filamentous membrane, with a small tentacle on tip, its height 5 in length. Third spine $5\frac{1}{4}$, standing one-fourth of length behind snout, proximally embedded, slender, and tapered into a hairy point. Fourth, fifth, and sixth spines of same structure as the third, frail, following closely together behind the third; the height of the fourth the same as that of the first, the remaining two somewhat shorter. Soft dorsal fin beginning a little in advance of vent, its membrane extending to end; tips of rays curled back; anterior rays shorter, especially the first; fifth ray highest, its tip, held down, reaches to the posterior base of the fin, where the tips of the remaining rays also terminate. Anal fin begins a little behind vent, its membrane extending to the end as in the dorsal; fifth or longest ray

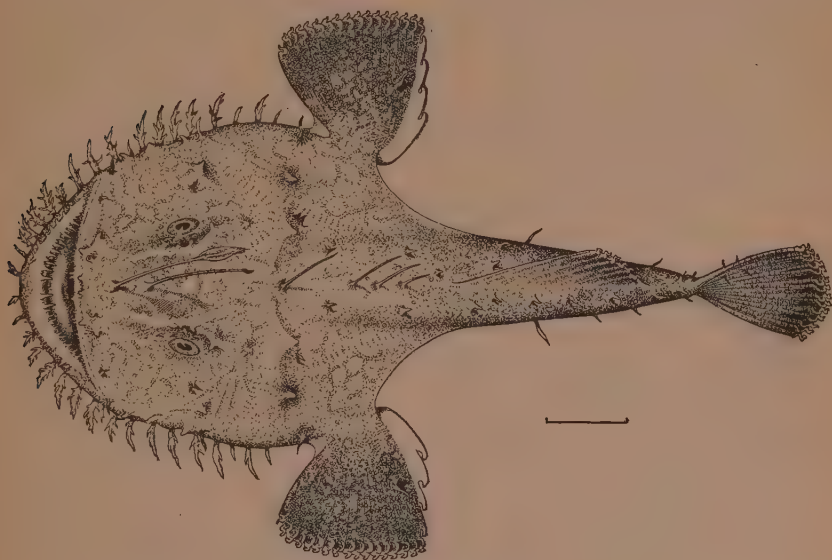


FIG. 1.—*LOPHIOMUS LITULON*.

extending beyond the posterior base of the fin. Filaments around mouth and on body not so numerous as in *L. setigerus*, those on body not forming a row. Spine on head rather high. Humeral spines simple, stout, pointing more upward than backward. Peritoneum uncolored, pale; teeth arranged as in *L. setigerus*. Mouth unmarked, pale within, and without spots.

Color of the type specimen pale brownish orange, with brown streaks and numerous small, light dots reticulating all over dorsal surface; roots of posterior dorsal spines and ends of fins blackish brown, as are also the filaments on body. Belly whitish, without markings except the inner side of ventral fin, which is dark brown; lower side of body brown, unmarked; inside of mouth without markings.

Coasts of middle Japan, as common as the preceding, but ranging

farther north. Our specimens are from Tokyo, Wakanoura, Totomi Bay and Matsushima Bay, the last two dredged by the U. S. Fish Commission steamer *Albatross*.

This description is from a specimen obtained in Tokyo. All other specimens have a blackish gray color, especially that from Matsushima, with the ends of fins and filaments black or blackish.

The chief differences between *L. litulon* and *L. setigerus* are the following: In *L. litulon* the first dorsal spine is not longer than the second, the ventral fin is colored, the inside of the mouth is unmarked, the membranes in the dorsal and anal fins extend to the tips of the rays, the peritoneum is uncolored, the head is generally less than 2 in length, but never more, as is invariably the case in *L. setigerus*, and the pectoral fins are slenderer.

This species, with the preceding, is known as *Anko*; in some localities the male is called *Kianko*, or true *Anko*, the female *Mizuko* (water creature).

(λίτος, plain-colored; οὔλον, gums; the species lacking the peculiar mouth markings of *L. setigerus*.)

Measurements of Lophiomus litulon.

Locality.	Tokyo.	Matsushima.	Wakanoura.	
Length in millimeters	192	266	97	86
Number of dorsal rays	II-IV-9	II-IV-10	II-IV-9	II-IV-9
Number of caudal rays	8	8	8	8
Number of anal rays	8	8	8	8
Number of pectoral rays	23	23	23	25
Number of ventral rays	5	5	5	5
Head in hundredths of length	51	49	45	51
Width of head	51	51	54	52
Width of body close to gill opening	19	17	18	19
Depth of caudal peduncle	5	5	5	5
Length of tail	35	38	34	33
Snout	15	15	15	14½
Length of maxillary	20	20	21	21½
Space between maxillaries	8	8½	7½	8
Diameter of eye (transversely)	6½	7	8	8
Interorbital space	13	13	13½	13
Snout to the tip of humeral spine	39	40	39½	42½
Distance between tips of humeral spine	35	33	32	36
Snout to first dorsal spine	5½	5	5	5½
Height of first dorsal spine	15	19	12	14
Snout to second dorsal spine	9	8½	8½	8½
Height of second dorsal spine	20	22½	19	22
Snout to third dorsal spine	26	24	25	28
Height of third dorsal spine	19	14	14	17
Snout to fourth dorsal spine	37½	35	38	38
Height of fourth dorsal spine	15	14	13	16
Snout to root of dorsal fin	62	60	60	63
Length of base of dorsal fin	32	.....	31	29½
Height of dorsal ray	18	.....	23	23
Length of caudal fin	25	28	27	30
Base of anal fin	27	.....	.....	.....
Height of anal fin	21½	.....	18	30
Length of pectoral fin	21½	29	28	34
Length of ventral fin	16	15	20	24
Ventral fin to vent	43	33	42	41
Vent to anal fin	4	7	8	4

Family II. ANTENNARIIDÆ.

FROG-FISHES.

Head and body more or less compressed. Mouth vertical or very oblique, opening upward; lower jaw projecting; jaws with cardiform teeth; premaxillaries protractile. Gill openings small, pore-like, in or behind the lower axils of the pectorals. No pseudobranchiæ. Gills $2\frac{1}{2}$ or 3; skin naked, smooth, or prickly. Pectoral members forming an elbow-like angle. Pseudobranchia long, with 3 actinosts. Ventral fins present, jugular, near together. Spinous dorsal of 1 to 3 serrated, tentacle-like spines; soft dorsal long, larger than anal. Pyloric cæca none. Inhabitants of tropical seas, often living on floating seaweed, and enabled, by filling the capacious stomach with air, to sustain themselves on the surface of the water, therefore widely dispersed by currents in the sea.

- a. Head compressed; a rostral spine or tentacle, followed by two larger spines; palatine teeth developed; dorsal spines disconnected.
- b. Skin naked and smooth; ventral fins elongate *Pterophryne* 2
- bb. Skin covered with prickles; ventral fins short..... *Antennarius*, 3
- aa. Head cuboid; a single rostral spine or tentacle, received in a groove; soft dorsal low..... *Chaunax*, 4

2. PTEROPHRYNE Gill.

Pterophryne GILL, Proc. Ac. Nat. Sci. Phila., 1863, p. 90 (*histrio*).

Pterophrynoides GILL, Proc. U. S. Nat. Mus., I, 1878, p. 216 (*histrio*). Name a substitute for *Pterophryne*, if regarded as preoccupied by an earlier name *Pterophrynus*.

Body short, somewhat compressed, with tumid abdomen, and covered by smooth or slightly granular skin; mouth small, oblique; palate with teeth; wrist slender; ventrals elongate; color light brown, much varied, with silvery dark markings. Small fishes of fantastic forms, widely distributed, living in floating seaweed. The species are very much alike and subject to much variation, and therefore not well defined or understood.

(πτερόν, wing; φρύνη, toad.)

- a. Body with very few round, small white spots or none; belly with faint blackish spots; sides with numerous filaments *histrio*, 3
- aa. Body with very many round white spots of different sizes; belly without dark spots; sides with few filaments; dark markings sharper and broader than in *P. histrio*..... *ranina*, 4

3. *PTEROPHRYNE HISTRIO* (Linnæus).

Lophius histrio LINNÆUS, Syst. Nat., 10th ed., 1758, p. 327; China, after *Lophius pinnis dorsalibus tribus* of Lagerstrom; may be any *Histrio* of Asiatic waters.

?*Lophius histrio* var. *marmoratus* SCHNEIDER, Syst. Ichth., 1801, p. 142; after a figure of Klein, locality unknown, called *Batrachus mollis* Klein, Missus III, 1742, p. 16, pl. xiv, fig. 4, white spots very few; may be any *Pterophryne*.
Chironectes marmoratus SCHLEGEL, Fauna Japonica, 1846, p. 159, pl. LXXXI, fig. 1; Nagasaki.

Antennarius marmoratus of most recent authors.

Head measured to gill opening 2 in length, depth $1\frac{1}{4}$; width 5; length of tail 3; caudal peduncle $6\frac{2}{3}$; length of maxillary 5; snout $2\frac{1}{4}$ in maxillary; eye 2 in snout; snout to end of actinosts $1\frac{2}{3}$ in length;

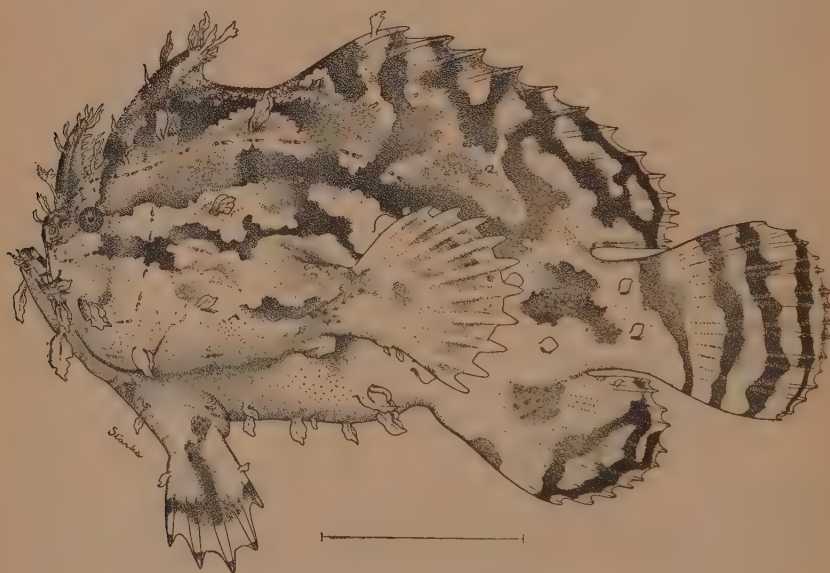


FIG. 2.—*PTEROPHRYNE HISTRIO*.

height of dorsal, anal, and caudal rays each 3 in length of body; base of dorsal fin $1\frac{1}{4}$. Pectoral and ventral fin each 4 in length. D. III-12; A. 7; C. 8; P. 10; V. 5. Height and position of dorsal spines essentially as in *P. raninus*, except that the tentacle on first spine is smaller; mouth oblique; skin not very loose; filaments numerous, rather stout, high. those on jaw and belly specially so; dorsal, pectoral and ventral fins with very small filaments—anal, and caudal fins free from them.

Color pale yellowish, with grayish tinge, marbled with blackish streaks punctuated by a few dots of the ground color; belly with faint blackish dots, filaments on belly immaculate; streaks on fins forming irregular bands; four cross bands on caudal very distinct, with sharp edges; marking around head on same general plan as that of *P. ranina*,

but with the light streaks wider; sides of body with few filaments and no well-defined round white spots.

The chief points of difference between this species and the next are the following: *Pterophryne histrio* has very few pale spots or dots on body; the filaments are more numerous and stouter, the four dark bands on the caudal more sharply defined, the belly with a few dark spots.

Coasts of Japan, in the open sea or current of the Kuro Shiwo, not rare. Our two specimens are from Kisaki and Enoshima.

The synonymy of this species is extremely doubtful. Probably most of the descriptions published under the names of *marmoratus* and *histrio* belong to it. The American species, called *Pterophryne histrio* by Jordan and Evermann, if distinct, should probably stand as *Pterophryne tumida* (Osbeck). This species was based on specimens from the Sargasso Sea, while the original type of *Lophius histrio* was Chinese. (*Histrio*, a harlequin).

Measurements of Pterophryne histrio.

Locality.	Misaki.
Length in millimeters	77
Fin rays	D. III, 12; A. 7; C. 8; P. 10; V. 5.
Head in hundredths of length	50
Width of head	20
Depth of head	56
Length of tail	33
Depth of caudal peduncle	15
Width of body above vent	12
Snout	9
Eye	4
Width of interorbital region	10
Length of maxillary	20
Snout to first dorsal spine	5
Height of first dorsal spine	5
Height of second dorsal spine	13
Snout to third dorsal spine	17
Height of third dorsal spine	18
Snout to root of dorsal fin	44
Height of dorsal rays	32
Length of dorsal fin	56
Length of caudal fin	32
Height of anal fin	32
Snout to end of actinost.	60
Length of pectoral fin	24
Length of ventral rays	25
Snout to root of ventral rays	40

4. PTEROPHRYNE RANINA (Tilesius).

Lophius raninus TILESIIUS, Mém. Natur. Mosc., XI, pl. xvi, 1809; Japan.

Antennarius nitidus BENNETT, Zool. Journ., III, p. 375, pl. ix, fig. 2.

Antennarius marmoratus var. *raninus*, GÜNTHER, Cat. Fish., III, 1861, p. 187; China, Pinang.—ISHIKAWA, Prel. Cat., 1897, p. 36; Tokio, Sagami.

Head measured to gill opening in axil, $1\frac{3}{8}$ in length, its depth slightly exceeding its length, width 6 in its depth; length of tail, $2\frac{3}{4}$; snout, $5\frac{1}{2}$ in depth of head; eye, $2\frac{1}{2}$ in snout; length of maxillary, 4. D. III, 12; A. 7; P. 9; V. 5. Snout to end of wrist, $1\frac{1}{4}$; height of dorsal rays,

$2\frac{1}{3}$; its base, 4; length of caudal fin, $2\frac{1}{3}$; that of pectoral fin, $3\frac{2}{3}$; ventral rays, $3\frac{2}{3}$.

First dorsal spine placed an eye's length behind tip of snout, slender, one-half in height of the second or equal to diameter of eye, with short, uncolored bifid tentacle; second dorsal spine situated just posterior to the first, straight filamentous, curved, imbedded posteriorly in a fold of skin extending from the back. Posterior rays of dorsal and anal fins extending one-fourth way into caudal fin. Wrist a little shorter than pectoral fin, with gill opening at its middle. Tip of pectoral fin reaches back to the middle of caudal peduncle. Ventral fins



FIG. 3.—PTEROPHRYNE RANINA.

slender, the tip reaching anteriorly to the vertical line from front of eye. Mouth oblique. Body finely granular, the skin very loose.

Color of body pale, yellowish gray, marbled with blackish brown; belly uncolored; many small sharply-defined white spots all over body except on caudal fin. Filaments on head and belly rather few, those on belly rising from center of white spots. A narrow, white-margined gray streak radiating posteriorly from eye and dilating behind; a wide, irregular, unmargined streak upward, meeting with the opposite one at posterior base of second dorsal spine; another wide streak of similar nature ventrally dilating and ending at the angle of mouth. Two large, pale, white-margined gray spots on side of body, each with a white filament in its center; ventral fins irregularly barred;

the antero-ventral side of pectoral fins light, except a brown bar running obliquely across each; postero-dorsal side thickly marbled, tips of rays pale yellow; caudal fin somewhat more regularly barred than others.

Coasts of Japan; less common than the preceding; here described from a specimen $4\frac{1}{2}$ inches long from Wakanoura.

This species is apparently distinct from the preceding, and both are probably different from the American species, *Pterophryne tumida* and *P. gibba*. A fourth species, very close to the *Pterophryne ranina* similarly spotted with white, but differing in other markings, is found in the Philippines. This form may be the original *marmoratus* of Klein and Schneider, or it may be that all these various patterns of coloration may be mere varieties of *P. histrio* and that but a single species of *Pterophryne* exists.

The synonymy of this species, like that of the preceding, is very doubtful, the names adopted for both being tentative only.

(*Ranina*, like a frog.)

Measurements of Pterophryne ranina.

Locality.....	Wakanoura.
Length in millimeters.....	84
Fin rays.....	D. III, 13; A. 6; C. 8; P. 9; V. 5
Head measured to gill opening in hundredths of length....	56
Width of head.....	29
Depth of head.....	60
Length of tail.....	35
Depth of caudal peduncle.....	17
Width of body above vent.....	11
Snout.....	11
Eye.....	5
Width of head at orbital region.....	12
Length of maxillary.....	25
Snout to first dorsal spine.....	6
Height of first dorsal spine.....	5
Height of second dorsal spine.....	12
Snout to third dorsal spine.....	21
Height of third dorsal spine.....	20
Snout to root of dorsal fin.....	45
Height of dorsal rays.....	37
Length of dorsal fin.....	58
Length of caudal fin.....	37
Height of anal fin.....	35
Snout to end of actinosts.....	63
Length of pectoral fin.....	27
Length of ventral rays.....	29
Snout to root of ventral rays.....	42

3. ANTENNARIUS Lacépède.

Antennarius COMMERSON in LACÉPÈDE, Hist. Nat. Poiss., I, 1798, p. 323. Foot-note only; not accepted by Lacépède.

? *Histrio* FISCHER, Zoognosia, 3d ed., I, 1813, p. 78. Definition incorrect; through a slip of the pen, "caput depressum" written instead of "caput compressum." No type mentioned. Fischer's *Lophius histrio* (Bloch, IV, p. 10, pl. cxi) is partly a true *Antennarius* according to Dr. Gill, probably *A. scaber*.

Les Chironectes (*Antennarius* Commerson) CUVIER, Règne Animal, 1st ed., I, 1817, p. 310; 2d ed., II, 1829, p. 251. *Chironectes* preoccupied in mammals by *Chironectes* Illiger, 1811.

Body oblong, compressed, very deep through the occipital region, tapering behind; breast tumid; mouth rather large, more or less oblique, or even vertical; cardiform teeth on jaws, vomer, and palatines; eye small; skin with small granules or spinules, these usually forked, and often with numerous fleshy slips. First dorsal spine developed as a small rostral tentacle; second and third dorsal spines strong, covered with skin, often with numerous fleshy filaments; soft dorsal high and long; anal short and deep; caudal fin rounded, the peduncle free; pectoral fins wide, with a rather wide wrist, at the lower posterior angle of which are the very small gill openings; ventral fins short. Fantastic looking fishes, often gayly colored; very numerous in warm seas.

(*Antenna*, a feeler or tentacle.)

- a. Color brown, with blackish streaks and markings, and without red spots; first dorsal spine trifid.
- b. Dorsal fin without large black ocellus at its base just behind its middle; stripes on body rather broad and more or less irregular, without the definite arrangement seen in the next species.....*tridens*, 5.
- bb. Dorsal fin with a single large black ocellus at its base just behind the middle; lines on body narrow, forming a regular complicated pattern.....*scriptissimus*, 6.
- aa. Color pinkish with a few blood-red spots, besides red streaks and markings; first dorsal spine trifid.....*sanguifluus*, 7.
- aaa. Color black, with small white specks, and larger jet-black blotches; first dorsal spine simple.....*nox*, 8.

5. ANTENNARIUS TRIDENS (Schlegel).

IZARI-UWO (CRAWLING FISH).

Chironectes tridens SCHLEGEL, Fauna Japon., 1846, p. 159, pl. LXXXI, figs. 2, 3, 5; Nagasaki.—BLEEKER, Verh. Bat. Gen. Japan, XXV, p. 47; Nagasaki.

Antennarius tridens GÜNTHER, Cat. Fish., III, 1861, p. 191; China.—NYSTROM, Kong. Svensk. Vet. Ak., 1887, p. 37; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 36; Tokyo, Kagoshima, Ogosahara, Bonin Islands.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 380; Yokohama.

Head $1\frac{3}{4}$ to 2 in body, $2\frac{1}{4}$ in total length. Depth $2\frac{1}{2}$ ($2\frac{1}{3}$ to $2\frac{3}{4}$) in body. Snout $5\frac{1}{2}$ in head, $2\frac{1}{2}$ in cleft of mouth, which is almost vertical. Eye $1\frac{1}{2}$ in snout.

D. III, 12; A. 7; P. 11; V. 5; C. 9. First dorsal spine 4 in head, with trifid tentacle of variable length, the two outer flaps are longer and stouter than the middle one, usually as long as the spine or even longer. Second spine shorter than the first by one-third to one-fourth of its height, slightly curved, its filamentous tip, when laid down, reaching the same point as that of the first. Third spine rising proximal to this point, which is opposite to the posterior edge of the maxillary; height of the spine $2\frac{1}{2}$ to $2\frac{2}{3}$ in depth of body, $3\frac{1}{2}$ in head; a dermal fold extends posteriorly to the base of soft dorsal. Soft dorsal beginning opposite to the anterior margin of the pectoral fin, its height about equal to the anal, its length $1\frac{1}{2}$ in head; its last ray does

not extend to caudal fin; length of anal $4\frac{1}{2}$ in head, the last ray usually extends to or beyond the root of caudal fin; length of caudal fin somewhat greater than the height of the dorsal, being $2\frac{1}{4}$ – $2\frac{1}{2}$ of caudal peduncle, $2\frac{1}{4}$ in head. Pectoral fins short, about $1\frac{1}{2}$ in caudal; $4\frac{1}{2}$ in head; bent backward, the tips do not quite reach to vent. The majority of Nagasaki specimens have longer pectoral fins, their tips reaching to vent. Ventral fins very short, about 2 in the pectoral.

Body covered with bifid spinules. Stubble-like mucous tubes with clusters of spinules around them running in a row along supraorbital edge and extending along edge of cheeks or scattered over head, especially on lower jaw; filaments rather numerous over head and body, conspicuous on jaw and around mouth; some specimens have scarcely any on body.

Ground color pale bluish gray, marked with black elongate spots or detached bars of various forms, those on body usually running diagonally transverse, those on abdominal region almost laterally; fins more or less regularly barred with rows of dots, those of the caudal being more regular; the dorsal fin, or its base, often marked with two or more large, diffuse, semiocellated spots, similar spots sometimes present on side of body also; usually seven black streaks radiating from eye in equal distance to each other; rest of head and body covered with numerous black spots, most conspicuous around ventral fins; first dorsal spine checked with six or more black bars.

Coast of Japan, in shallow, muddy bays, almost everywhere very common, the colors variable, but always dull.

Yellow specimens, similar to the yellow variety figured by Schlegel and referred by him to *A. tridens*, were taken at Nagasaki. These have been mislaid and can not be compared by us with the typical form. The yellow form is probably not a distinct species.

Our many specimens are from Nagasaki, Wakanoura, Kobe, Enoshima, Uruga, Misaki, and Tokyo.

(*Tridens*, three-toothed.)

6. ANTENNARIUS SCRIPTISSIMUS Jordan, new species.

Head to gill opening about $\frac{1}{2}$ the length; a little less than depth of body. Lateral line ceasing under soft dorsal composed of 14 large pores; skin everywhere very rough. D. III–12; A. 8; pores of lateral line 14. First dorsal spine slender; its length scarcely more than two times diameter of eye; third dorsal spine very stout, rough.

Color yellowish gray; everywhere covered with narrow straightish, parallel, dark brown lines running in different directions on different parts of the body; some radiate from eye; some extend from eye horizontally to above pectoral; those below eye extending downward and backward to pectoral, ventral, and throat; stripes behind pectoral radiating from axil; those nearest gill opening curving around it; streaks

above level of gill opening nearly vertical, below nearly horizontal; the former at right angles to those running backward from eye; streaks on back above lateral line nearly vertical and extending upward across third dorsal spine and soft dorsal fin; anal, caudal, and pectoral with oblique, wavy, dark cross streaks. A single ocellus present, large, dark brown, with a pale edge, on base of soft dorsal, behind its middle.

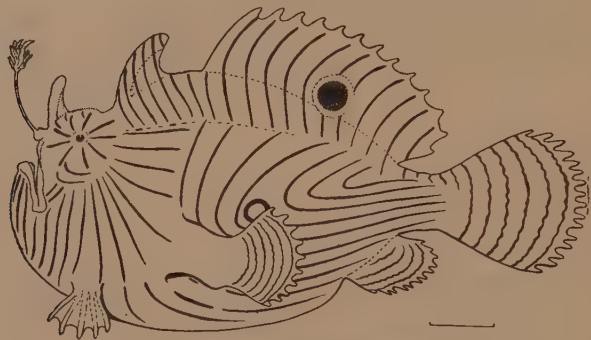


FIG. 4.—*ANTENNARIUS SCRIPTISSIMUS*.

The type, a stuffed specimen in good condition, 10 inches long, is in the Imperial Museum at Tokyo. It was taken at Boshu, province of Awa, at the entrance of Tokyo Bay.

The accompanying illustration is from a copy of a rough sketch of the type. It was designed only to show the markings. It is not correct as to details of form.

(*Scriptissimus*, much written over.)

7. *ANTENNARIUS SANGUIFLUUS* Jordan, new species.

Head, measured to gill opening at the base of pectoral fin, 2 in body, $2\frac{2}{5}$ in total length. Depth $1\frac{3}{8}$ in body, $2\frac{1}{5}$ in total length; trunk equal to tail; D. III—12; A. 7; C. 9; P. 10; V. 5. Caudal fin $1\frac{1}{2}$ in tail, $2\frac{1}{5}$ in caudal peduncle. First dorsal spine slender, high as the length of snout, placed above nostrils, with a stout, knob-like tentacle; second spine free, rough, curved backward, half the eye's length higher than the first; third spine embedded, very stout, curved strongly backward, 3 in depth, $1\frac{2}{3}$ of the second. Snout $5\frac{1}{2}$ in head. Eye $1\frac{1}{2}$ in snout. Length of base of dorsal fin equal to depth of body. Pectorals reaching to vent. Spines bifid; integument firm. General features essentially as in *Antennarius* *nov.*, except as to color.

Color in life, as in spirits, pinkish; a blood-red spot with lighter center on each side of body, above gill opening, on the level of angle of mouth; one red spot at anterior base of dorsal fin; a red streak along the antero-dorsal edge of wrist; last rays of dorsal and anal fins and tip of caudal fin also red; minute red spots on dorsal fin; a large

brown spot at middle of the base of dorsal fin; first ray of dorsal fin and upper part of caudal fin brown; brown streaks radiating from eye; numerous minute brown spots in form of rings or streaks on side of body, especially at the root of pectoral fins; spinules uncolored.

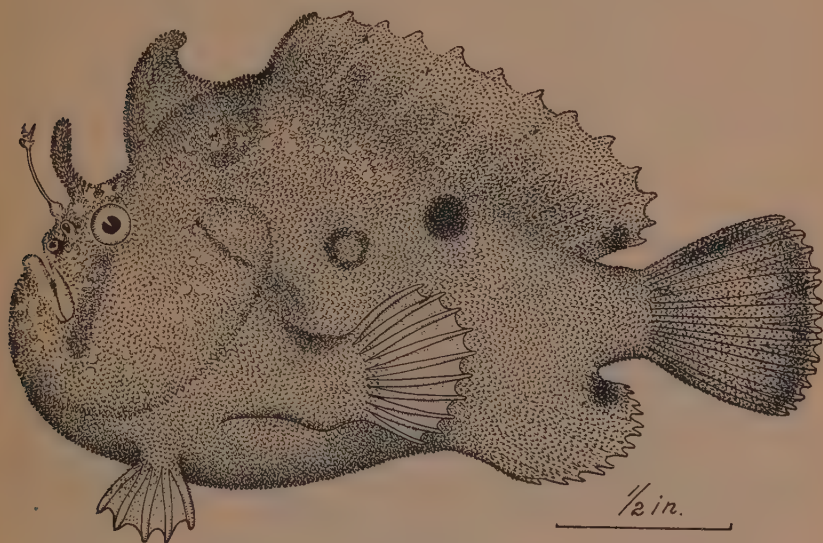


FIG. 5.—*ANTENNARIUS SANGUIFLUUS*.

Two specimens are known, both from Misaki, the one collected by Dr. Jordan, the other by Dr. Mitsukuri.

(*Sanguis*, blood; *fluus*, flowing.)

8. *ANTENNARIUS NOX* Jordan, new species.

Head $1\frac{3}{4}$ in body, or $2\frac{3}{8}$ in total length. Depth equal to head; height of the dorsal fin equal to the length of the caudal. D. III-12; A. 7; P. 11; V. 5; C. 9. Caudal peduncle 2 in caudal fin; snout 6 in head, $2\frac{1}{2}$ in cleft of mouth, which is nearly vertical; eye less than 2 in snout. First dorsal spine 2 in caudal fin, or $3\frac{1}{2}$ in head, the stout tentacle usually quadrifid, but sometimes trifid, as in *A. tridens*; second spine stout, slightly lower than the first, perceptibly curved, devoid of filaments, with a thin, free membrane posteriorly; it stands $\frac{2}{3}$ the length of eye behind the base of the first. Third dorsal spine $1\frac{1}{2}$ in caudal fin, $2\frac{1}{4}$ in depth; curved considerably backward; dermal fold extending from the top to the base of first soft dorsal ray, whence the tip of spine also reaches. Dorsal fin a little longer than head; the third ray from last extending to the caudal fin; anal slightly lower than dorsal, length $1\frac{1}{2}$ in caudal peduncle, $2\frac{1}{2}$ in head; the tip extending well beyond base of caudal. Pectoral fin $2\frac{1}{4}$ its width, 3 in head; laid against body

its tip reaches to vent; ventral fin 5 in head, placed directly beneath eye.

Body covered with forked spinules; skin firmer and tighter than that of *A. tridens*. Color black or dusky brown, with two (or three) large and several small jet-black spots on each side of body and dorsal fin; black streaks radiating from eye; a white blotch at the posterior base of second dorsal spine; minute white spots scattered on dorsal fin; each caudal ray with a white spot a little below middle, forming a transverse row on the fin. Some specimens are almost perfectly black, hardly

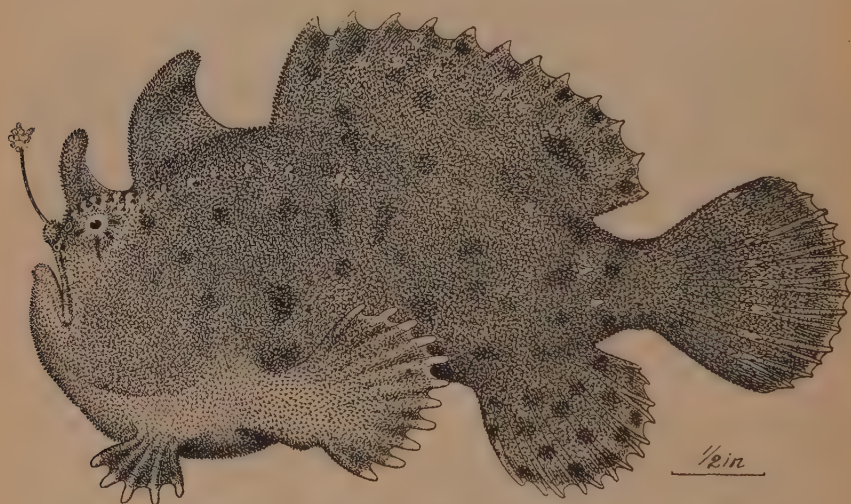


FIG. 6.—*Antennarius nox*.

any marks being distinguishable. Belly and tip of pectoral, ventral, and anal fins dull dark gray; very short filaments from the tops of small white protuberances sparsely scattered over body; arrangement of mucous tubes similar to that of *A. tridens*.

This species differ from *A. tridens* in color, length of fins, especially that of dorsal and anal fins, and in having firmer and tighter integument; second and third dorsal spines and soft dorsal without filaments.

Our specimens, 6 in number, are from Wakanoura and Nagasaki. (*Nox*, night).

4. *CHAUNAX* Lowe.

Chaunax Lowe, Trans. Zool. Soc. Lond., III, 1846, p. 339 (*pictus*).

Head very large, depressed, cuboid. Mouth large, subvertical; jaws and palate with bands of small teeth. Skin with small, sharp spines. Spinous dorsal reduced to a small tentacle above the snout, retractile into a groove; soft dorsal moderate, low; anal short; ventrals small. Gills $2\frac{1}{2}$; no pseudobranchiae. Muciferous channels very conspicuous, the lateral line prominent, undulate; another series of mucous tubes extending

from lower jaw to axil; still another extending backward from snout and maxillary to a point behind eye, when it ceases, uniting with a vertical line which extends from the lateral line to the lower line; these lines thus inclose a quadrate area on the cheek. Gill opening small, well behind pectoral under front of soft dorsal. Deep seas.

(*χαύραξ*, one who gapes).

9. CHAUNAX FIMBRIATUS Hilgendorf.

Chaunax fimbriatus HILGENDORF, Gesellsch. Naturf. Freunde, 1879, p. 80; off Tokyo.

Chaunax pictus ISHIKAWA, Prel. Cat., 1897, p. 37; Japan (not of Lowe).

Head measured to the anterior edge of gill opening, $1\frac{1}{2}$ in length, excluding caudal fin; 2 in total length; depth $2\frac{3}{4}$ in body; $3\frac{1}{2}$ in total length; snout $6\frac{1}{2}$ in head; eye 2 in snout. Head wider than deep. Rostral spine short, nearly equal to eye. Gill opening below fifth or sixth soft rays of dorsal.

D. I-I-I-11; A. 6; C. 8; P. 14; V. 4. Mouth vertical, the end of maxillary not hidden. Length of maxillary $3\frac{1}{2}$ in head. Posterior part of spinous dorsal of one spine hidden in a fold of skin. Mucous channel chain-like; extending from tip of snout above eye to a point behind eye along supraorbital edge, then downward, connecting with lateral line which is abruptly bent above anal fin; branch extending backward from middle of maxillary below eye; a similar groove from lower jaw backward to upper base of pectoral fin. Series of pores below eye connected by a vertical series of pores to base of lateral line; these pores on cheek surrounding a quadrangular patch of skin. Spinules simple, rather high.

Color, in spirits, uniform pale pinkish yellow; the largest specimens dirty gray. Skin semitransparent on belly; very loose.

Coast of Japan, in rather deep water, here described from a specimen 10 inches long, from Sagami Bay. Many smaller specimens were dredged in Suruga Bay by the United States Fish Commission steamer *Albatross*, and two more in Sagami Bay.

(*Fimbriatus*, fringed).

FAMILY III. OGCOCEPHALIDÆ.

THE BAT FISHES.

Head very broad and depressed, the snout more or less elevated, the trunk short and slender. Mouth not large, subterminal or inferior, the lower jaw included; teeth villiform or cardiform. Gill openings very small, above and behind the axils of the pectoral fins. Body and head covered with bony tubercles or spines. Spinous dorsal reduced to a small rostral tentacle which is retractile into a cavity under a prominent process in the forehead; in one genus the rostral tentacle is obsolete; soft fin well developed, its base strongly

angled, with long pseudobrachia and 3 actinosts; branchiostegals, 5; no pseudobranchiæ.

a. *Ogcocephalinæ*: Disk with frontal region elevated and the snout more or less produced forward, the tail stout; orbit lateral; teeth on vomer and palatines; rostral tentacle present.

b. Gills 2; disk broad *Malthopsis*, 5

aa. *Halieutæinæ*: Disk with frontal region depressed, not elevated above the rest of body; eyes partly superior; snout rounded, obtuse in front; tail slender.

c. Dorsal fin present; vomer and palatines toothless; disk subcircular; gills 2½; mouth rather large, subvertical; prickles rather strong *Halieutæa*, 6

5. MALTHOPSIS Alcock.

Malthopsis Alcock, Ann. Mag. Nat. Hist., 1891, p. 26 (*luteus*).

Disk triangular, usually wider than long, when expanded about as long as rest of body (including caudal fin); middle line of head elevated, the forehead more or less projecting beyond mouth; rostral tentacle present, its cavity about as wide as high; mouth small; minute teeth on vomer and palatines. Gills, 2.

Small fishes of the sea bottoms of Asia; differing from the New World genus *Ogcocephalus* (*Malthe*), chiefly in the reduced gills.

(*μάλθη*, *Malthe*, a synonym of *Ogcocephalus*; ὄψις, appearance.)

10. MALTHOPSIS TIARELLA Jordan, new species.

Head triangular, measured to gill opening, a little more than one-half of length exclusive of caudal fin, the elevated snout at the apex; a stout, protruding supraoral spine on the tip of snout, the height of which from eye is $7\frac{1}{4}$ in length; base of triangle of disk rather longer than the sides; the length of the latter equal to that of head. Eyes large, lateral, their diameter nearly equal to the height of supraoral spine. Snout short, about two-thirds of eye; mouth smaller than eye; a groove above mouth containing a small rostral tentacle; the cavity higher than wide; interorbital space one-half of the height of supraorbital spine; width of trunk at axil $6\frac{2}{3}$ in length. Length of tail $2\frac{1}{2}$; distance between vent to anal fin slightly more than two in tail; D. 7; A. 3; P. 10 (?); C. 6; tip of anal rays extending to root of caudal fin; root of caudal fin to anterior base of dorsal fin 3 in length; length of caudal fin $3\frac{1}{2}$ in length; ventral fin slender; pectoral fin 4 in length; depth of caudal peduncle equal to height of cavity above snout.

Cranial region elevated in front, depressed posteriorly; trunk slender, somewhat deeper than wide, tapering toward caudal fin; spines on supraorbital and occipital region rather prominent, forming two rows, leaving a clear space along median line of head. Three rows of spines on edge of head, the middle row terminating in lower jaw, the upper row dilating under eye and continued to the end of maxillary. Posterior angle of head ending in a sharp triangular protuberance with four spinules on tip. Body and wrists covered with bony plates in

irregular rows, each with a prominence in center, surmounted by a posteriorly-pointed spine. Gills, 2.

Color, gray, with a brownish patch with small dark dots around region of axil; suborbital region reticulated with brown streaks; a dark band crossing near end of caudal and pectoral fins and base of caudal fin; anal fin dark; belly dusky. Skin on dorsal side of abdominal region and ventral side of head, thin and rather loose.

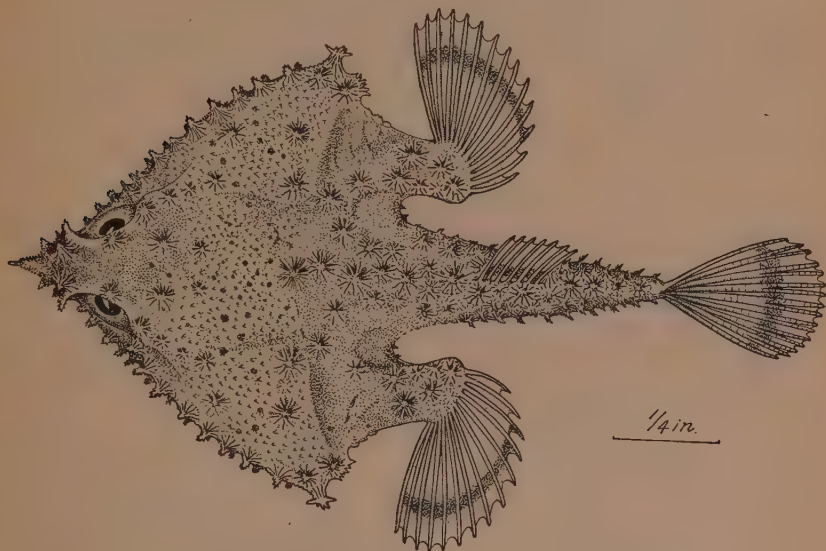


FIG. 7.—*MALTHOPSIS TIARELLA*.

Coast of Japan, in rather deep water; described from a specimen $1\frac{1}{2}$ inches long from Suruga Bay, near Numazu, dredged by the United States Fish Commission steamer *Albatross*. This specimen is in the United States National Museum. No. 49801, U.S.N.M.

(Name, a diminutive of *tiara*, a miter.)

Measurements of Malthopsis tiarella.

Rays, D. 7; A. 3; P. 10; C. 6.	
Length in millimeters.....	37
Head in hundredths of length, measured to gill opening.....	55
Supraoral spine, from anterior edge of eye.....	14
Diameter of eye.....	13
Interorbital space.....	7
Width of mouth.....	10
Height of groove.....	8
Width of groove.....	5
Snout to posterior angle of opercle.....	54
Depth of head at vertical line over eye.....	21
Snout to dorsal fin.....	66
Snout to anal fin.....	78
Width of body at axil.....	15
Depth of caudal peduncle.....	8
Length of caudal fin.....	27
Length of pectoral fin.....	25
Snout to angle of wrist.....	65
Length of ventral fin.....	23
Length of tail.....	41
Vent to anal fin.....	21

6. HALIEUTÆA Cuvier and Valenciennes.

Halieutæa CUVIER AND VALENCIENNES, Hist. Nat. Poiss., XII, 1837, p. 455 (*stellatus*).

Head very large, broad, depressed, its outline nearly circular; cleft of mouth wide, horizontal; jaws with small cardiform teeth; no teeth on vomer or palatines. Skin everywhere covered with small, stellate spines. Forehead with a transverse bony ridge, beneath which is a tentacle, retractile into a cavity, the only rudiment of the spinous dorsal fin; soft dorsal and anal very short, far back. Gills $2\frac{1}{2}$, the anterior gill arch without laminae. Branchiostegals 5; vertebrae 17.

(ἀλιευτής, a fisher.)

II. HALIEUTÆA STELLATA (Vahl).

AKAGUTSU (RED SHOE).

Lophius stellata VAHL, Skr. Naturh. Kjobenh., IV, p. 214, pl. III, figs. 3, 4, 1797; Japan.

Halieutæa stellata CUVIER AND VALENCIENNES, Hist. Nat. Poiss., XII, p. 456, pl. CCLXVI; China.—SCHLEGEL, Fauna Japonica, 1846, p. 160, pl. LXXII; Nagasaki.—BLEEKER, Amboyna et Ceram., p. 279.—GÜNTHER, Cat. Fish., III, 1861, p. 203; China.—NYSTROM, Kong. Svensk. Ak., 1887, p. 37; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 36; Boshu, Tokyo, Ajiro, Izu.

Lophius faujas LACÉPÈDE, Hist. Nat. Poiss., I, 1798, p. 318; museum of the Hague.

Lophius muricatus SHAW, Gen. Zool., V, 1805, p. 382, pl. CLXII (after Lacépède).

Disk circular, with a groove posteriorly; wrists, with transversely projecting pectoral fins, forming angles at the beginning of the groove; diameter of disk three-fourths of length, exclusive of caudal fin; head measured to gill opening $1\frac{1}{2}$ in length; eye large, oblique, dorsal half covered by an extension of interorbital skin; mouth oblique, semi-inferior; gape 4 in length; a triangular cavity above mouth containing a stout tentacle, consisting of two equally divided lobes, with thin fleshy flaps at tip; height of cavity hardly less than its base, which is over 2 in eye; body tapering rapidly from axil toward caudal fin. Vent placed a little in advance to angle of wrist; distance from vent to root of caudal fin $2\frac{1}{2}$ in length. Vent to anal fin 2 in caudal fin; D. 5; A. 3; P. 12; V. 5; C. 8 or 9; length of caudal fin $3\frac{1}{2}$ in body; pectoral fin $3\frac{1}{2}$; ventral fin $5\frac{1}{2}$; cranial region raised; skin rather firm; dorsal surface covered with rather high, simple, straight spines, except the horny edge of disk and side of body, which are fringed with bony prominences, each terminating in three, four, or five spinules; interorbital space slightly depressed, free from spines; occipital region highest, covered with low spines, depressing gradually toward body; skin on belly and ventral side of head granular to touch, free from spines, except the bony edge of disk and mandible, which are covered with low blunt spines.

Color uniformly light yellowish, with slight brownish tinge, doubt-

less crimson or orange in life; tips of fins brown, except dorsal fin, which is somewhat lighter than other fins; tentacle slightly darker than body.

Coast of Japan, not very common. We have one specimen 68 millimeters long from Ajiro near Atami, presented by Dr. Ishikawa, from the Imperial Museum.

(*Stellatus*, starry.)

Measurements of Halieutæa stellata.

Rays, D. 5; A. 3; P. 12; V. 5; C. 8 or 9.	
Length in millimeters	68
Diameter of disk in hundredths of length	75
Head, to gill opening	58
Snout	11
Eye	11
Interorbital space	11
Gape of mouth, from angle to angle	25
Height of supraoral cavity	5½
Width of supraoral cavity	6
Snout to dorsal fin	70
Width of trunk at axil	16
Depth of caudal peduncle	5
Vent to root of caudal fin	35
Vent to anal fin	15
Length of caudal fin	29
Length of pectoral fin	31
Length of ventral fin	18

SUMMARY.

Family I. LOPHIIDÆ.

1. *Lophiomus* Gill.

1. *setigerus* (Vahl); Wakanoura, Nagasaki.
2. *litulon* Jordan; Tokyo, Wakanoura, Totomi Bay, Matsushima Bay.

Family II. ANTENNARIIDÆ.

2. *Pterophryne* Gill.

3. *histrio* (Linnæus); Misaki, Enoshima.
4. *ranina* (Tilesius); Wakanoura.
3. *Antennarius* Lacépède.
5. *tridens* (Schlegel); Nagasaki, Wakanoura, Kobe, Enoshima, Uruga, Misaki, Tokyo.
6. *scriptissimus* Jordan; Boshu.
7. *sanguifluus* Jordan; Misaki.
8. *nox* Jordan; Wakanoura, Nagasaki.

4. *Chaunax* Lowe.

9. *fimbriatus* Hilgendorf; Sagami Bay, Suruga Bay.

Family III. OGCOCEPHALIDÆ.

5. *Malthopsis* Alcock.

10. *tiarella* Jordan; Suruga Bay.

6. *Halieutæa* Cuvier and Valenciennes.

11. *stellata* (Vahl); Ajiro.

DESCRIPTIONS OF NEW AMERICAN BUTTERFLIES.

By WILLIAM SCHAUS.

The following descriptions of new species of American butterflies were prepared from the author's collection which is now deposited in the United States National Museum. The species are from various localities, mostly in Brazil, although a few are from Mexico and the West Indies. In the Hesperiidæ I have followed closely Godman's recent work, and I may have created a few synonyms, as both Plötz's and Herrich-Schaeffer's descriptions are difficult to identify. I believe, however, that the species here described are all new to science.

Family NYMPHALIDÆ.

DANAINÆ.

DIRCENNA HUGIA, new species.

Diagnosis.—Wings hyaline, yellowish gray; the veins and margins brown, widest at end of veins; large hyaline yellowish spots between the veins, along the outer margin and beyond the cells above vein 4; an opaque yellow streak on costal margin above end of cell on primaries, and a broad, brown discocellular shade; secondaries with less brown on discocellular and the outer margin somewhat broader. Underneath, primaries as above. Secondaries with the margin reddish brown; a blackish streak along upper portion of cell; linear white terminal spots shaded with black.

Expanse.—Seventy millimeters.

Habitat.—Bolivia.

Type.—No. 5859, U.S.N.M.

LEUCOTHYRIS MANORA, new species.

Diagnosis.—Wings hyaline, blue white; the veins and margins blackish. Primaries, the margins rather broad; the outer margin narrowest between veins 3 and 4; the apex inclosing a hyaline spot above vein 6; an oblique median spot from costa to veins 4 and 5; a

white spot on costa and a white streak on vein 6 beyond median spot. Secondaries, the outer margin broad, tapering to anal angle; some whitish shades between the veins on outer margins of both wings. Underneath the markings are reddish brown, edged with black; some terminal white spots on primaries above vein 5 to apex. Secondaries, a marginal gray line interrupted by the veins, and dark streaks between the veins.

Expanse.—Forty-six millimeters.

Habitat.—Rio Janeiro, Brazil.

Type.—No. 5860, U.S.N.M.

EPISCADA PASCUA, new species.

Diagnosis.—Body dark brown above, gray below. Wings hyaline, the veins and margins very narrowly brown. Primaries, a narrow brown discocellular shade; a hyaline costal streak above end of cell. Underneath, the margins reddish brown; a terminal black line on outer margins; a small apical white spot on secondaries.

Expanse.—Forty-six millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 5861, U.S.N.M.

EPISCADA CARCINIA, new species.

Diagnosis.—Wings hyaline; veins and margins very narrowly dark brown, thickening on outer margin at end of veins. Primaries, a reddish brown streak on basal half of costa; a discocellular dark brown shade tapering to a point at vein 4; the inner margin blackish brown below the submedian; a white costal spot beyond cell. Secondaries, the outer margin slightly wider than on primaries. Underneath, the margins light reddish brown; the costal margin of secondaries yellowish; some greenish scales at apex of secondaries.

Expanse.—Forty-five millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5862, U.S.N.M.

PTERONYMIA MINNA, new species.

Diagnosis.—Wings transparent, the veins and margins narrowly blackish brown. Primaries, the discocellular finely dark, followed by a yellow streak on costa, and a faint yellow shade from costa to vein 4; a marginal row of faint yellow spots; a reddish line above subcostal vein from base to end of cell.

Secondaries, the cell and inner margin faintly tinged with yellow. Underneath, the costal and outer margins reddish brown. Primaries, the discocellular streak reddish brown; a grayish streak on costal edge of median space; secondaries, a blackish streak on anterior portion of cell; a white spot at apex; one on extreme margin between 2 and 3.

and another between 3 and 4; these spots edged with dark brown; fringe brown.

Expanse.—Fifty-five millimeters.

Habitat.—Bolivia.

Type.—No. 5863, U.S.N.M.

PTERONYMIA CALGIRIA, new species.

Diagnosis.—Wings hyaline yellowish; the veins and margins narrowly dark brown. Primaries, a dark discocellular shade slightly curved; a yellow semihyaline costal streak beyond cell; marginal semihyaline yellowish spots; the cell shaded with yellow interrupted by a dark transverse shade at half its length. Secondaries shaded with yellow; the margin widest before vein 3 and at apex. Underneath, the apex and outer margin of primaries shaded with reddish brown; three apical white spots. Secondaries, the margins black; a reddish costal streak; a wavy reddish line in outer margin followed by linear white spots; two linear white spots on costal margin. The antennæ black, tipped with orange.

Expanse.—Fifty-seven millimeters.

Habitat.—Bolivia.

Type.—No. 5864, U.S.N.M.

PTERONYMIA CARLIA, new species.

Diagnosis.—Wings, hyaline blue white; the veins and margins narrowly black; Primaries, a broad blackish discocellular shade, widest on costa; a reddish brown streak on basal half of costa; a white spot on costa beyond cell; a semihyaline white spot above inner angle. Underneath, the margin and discocellular shade light reddish brown. Primaries, the inner margin blackish; the costa and apex irrorated with white hairs; a terminal black line on outer margin. Secondaries, a terminal dark line irrorated with white hairs, especially at apex.

Expanse.—Forty-six millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 5865, U.S.N.M.

PTERONYMIA ILSIA, new species.

Diagnosis.—Wings hyaline. Primaries, costa on basal half narrowly black with a reddish brown streak; a broad brown median spot from costa narrowing slightly at veins 3 and 4, followed by a white band which becomes semihyaline toward outer margin above vein 4; apex broadly brown; outer margin brown, moderately broad; inner margin grayish brown below submedian. Secondaries, a fairly broad brown outer margin, widest at apex, tapering to anal angle. Underneath, inner margin bark gray; outer margin reddish brown from inner

angle to vein 4; apex crossed by a reddish-brown band followed by three subapical whitish spots; median spot reddish brown edged with blackish. Secondaries, the margins light reddish brown; a terminal dark line; a white spot at apex; some white scales above and below the spot.

Expanse.—Forty-seven millimeters.

Habitat.—Bolivia.

Type.—No. 5866, U.S.N.M.

ITHOMIA SALCATA, new species.

Diagnosis.—*Male*.—Head black spotted with white. Collar reddish. Wings hyaline white, the veins and margins blackish brown. Primaries, the discocellular wide on costa, tapering to a point at vein 4, slightly curved, and followed by some white scales on costa; the outer margin narrower. Secondaries, the outer margin fairly broad. Underneath, the margins and discocellular shade light reddish brown edged with black. Primaries, three apical white spots. Secondaries, the costa yellowish; the gland and upper part of cell black; some small white spots above vein 3 on outer margin. The female has the hyaline portion irrorated with grayish scales.

Expanse.—Male, 42 millimeters; female, 48 millimeters.

Habitat.—Colombia.

Type.—No. 5867, U.S.N.M.

CALLOLERIA TOSCA, new species.

Diagnosis.—Wings thinly scaled, semitransparent. Primaries, costal, inner and outer margins narrowly black; between inner margin and submedian vein a reddish-brown shade from base to outer margin; the same on costal margin, from base to median black shade; cell irrorated with carneous and yellow scales; a black spot near base; a broad black median shade oblique from costa to veins 3 and 4, indented at end of cell, and followed by a broad pale yellow shade deeply dentate between 4 and 5, incurved below 4, then oblique to outer margin above vein 2; this yellow space is followed by a paler black shade which reaches the outer margin from below vein 3 to above vein 4, inclosing a round yellowish marginal spot between veins 3 and 4; the apex yellow, preceded by a broad pale yellowish transverse band from costa to below vein 5. Secondaries reddish brown; a black-subcostal streak; the outer margin black, the border forming inward curves between the veins on basal side; a blackish band from middle of inner margin to vein 5; the space between this band and outer margin tinged with yellow. Underneath brighter in tone; a marginal row of white spots. On secondaries the subcostal and median black lines meet between veins 5 and 6.

Expanse.—51 millimeters.

Habitat.—Colombia.

Type.—No. 5868, U.S.N.M.

SATYRINÆ.

EÜPTYCHIA OCELLOIDES, new species.

Diagnosis.—*Male.*—Wings brown; a darker terminal and marginal line. Primaries, a subapical black spot containing some lilacine scales and circled with yellowish; a similar spot on secondaries subterminally between veins 2 and 3; before the marginal line is another faint darker line somewhat wavy. Underneath grayish brown; the marginal lines more distinct. Primaries, the subapical spot as on upper surface, but again circled with a fine brown line; a faint oblique brownish outer line from costa to inner angle. Secondaries, a fine transverse brown line at one-third from base and another at two-thirds from base; a large apical ocellus containing two white points; the ocellus between veins 2 and 3 preceded and followed by a smaller ocellus, the yellow circles coalescing and the three finely edged with dark brown; the space between marginal and terminal lines yellowish.

Female.—Primaries similar to the male; secondaries with two ocelli near anal angle, both above and below.

Expanse.—Male, 27 millimeters; female, 31 millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5869, U.S.N.M.

EÜPTYCHIA CASTRENSIS, new species.

Diagnosis.—*Female.*—Wings brown with darker lines; a terminal and marginal line; a wavy dentate subterminal line; a straight outer line just beyond celli. Secondaries, the subterminal preceded by a subapical black point; a small ocellus below vein 2 and a larger one above vein 2; the ocelli black with white points and finely circled with yellow. Underneath brownish fawn color, the lines darker and as on upper surface; also a fine inner line, slightly curved on primaries, faintly wavy on secondaries. Primaries, an ocellus between veins 5 and 6; a small annular brown ring above vein 6, and three from veins 2 to 5, containing a few yellowish scales. Secondaries, the space between outer and subterminal lines whitish with a large ocellus between veins 5 and 6 and 2 and 3; a small ocellus below vein 2 and above vein 3, and a smaller geminate ocellus between veins 4 and 5.

The male is darker. The secondaries are without a subapical spot above. Underneath the primaries have only a single black subterminal point between veins 5 and 6; on the secondaries there is a small ocellus above vein 6, and the ocelli between veins 3 and 5 are reduced to lilacine flecks surmounted with brown.

Allied to *E. undina* Butler.

Expanse.—Thirty-two millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5870, U.S.N.M.

EUPTYCHIA NARAPA, new species.

Diagnosis.—*Male.*—Wings uniform brown; a dark terminal line. Underneath brown; a fine darker inner line; a straight outer line, dark brown, outwardly shaded with whitish; a lunular wavy subterminal line; a straight marginal line; the terminal line blackish. Primaries, four blackish ocelli with white points and faintly circled with yellow from veins 2 to 6. Secondaries, five ocelli as on primaries from veins 2 to 7, those between 2 and 3 and 5 and 6 slightly larger.

Expanse.—Thirty-one millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5871, U.S.N.M.

EUPTYCHIA MONECA, new species.

Diagnosis.—*Female.*—Wings dark brown, with darker terminal, marginal and subterminal lines; the latter wavy. Primaries, a dark point at end of cell; a dark outer line angled below costa, then straight to inner margin. Secondaries, the outer line incurved between 5 and 6, then wavy to inner margin; a faint inner line; an ocellus above vein 2, a smaller one below it. Underneath light brown, irrorated with darker striæ; the lines as above; the space between marginal and terminal lines yellowish. Primaries, a distinct inner line, nearly straight; a small ocellus between veins 5 and 6. Secondaries, a wavy inner line; an ocellus between veins 2 and 3, and one between 5 and 6, with two silver points; a smaller ocellus below vein 2 with a single silver point; a small geminate ocellus between 4 and 5; a minute ocellus above vein 3 and above vein 6.

Male.—The ocelli on secondaries above very small; those underneath also small, and not geminate between veins 4 and 5.

Expanse.—Male, twenty-nine millimeters; female, thirty-three millimeters.

Habitat.—Castro, Parana; Nova Friburgo, Brazil.

Type.—No. 5872, U.S.N.M.

EUPTYCHIA BURGIA, new species.

Diagnosis.—*Female.*—Wings dark brown; an outer dark straight line to near anal angle of secondaries; a wavy lunular subterminal line; a fine marginal and terminal line. Underneath olivaceous brown; a wavy dark brown inner line not reaching costa on primaries; a straight dark brown outer line, broadly shaded outwardly with lilacine gray; four minute ocelli on primaries between veins 2 to 6; five similar ocelli on secondaries between veins 2 to 7; the subterminal, marginal, and terminal lines very fine; the fringe gray, spotted with blackish.

Expanse.—Forty millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 5873, U.S.N.M.

EUPTYCHIA MORIMA, new species.

Diagnosis.—Wings dark brown, without markings; the apex of primaries somewhat truncated. Underneath brown. Primaries, a darker inner line, slightly curved; a wavy, indistinct outer line; five white points between veins 2 to 7; the outer margin irrorated with lilacine above vein 2; a faint wavy subterminal line. Secondaries, a wavy inner line; the median space from vein 6 to inner margin, also the outer margin, irrorated with lilacine scales; a straight outer line; six faint white points before the subterminal, which is fine, wavy, dentate.

Expanse.—Forty millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5874, U.S.N.M.

EUPTYCHIA PALLEMA, new species.

Diagnosis.—*Male*.—Wings light brown, with darker wavy, subterminal, marginal, and terminal lines. Underneath lilacine brown; a broad inner and outer transverse ochreous brown band, edged with dark brown, the latter angled near anal angle of secondaries; a broad brown shade beyond, on which are the ocelli; a small subapical ocellus on primaries; five ocelli on secondaries; those between veins 2 and 3 and 5 and 6 large, black, circled with yellow, and containing two silvery points; the ocellus above vein 6 similar but smaller; the ocelli between 3 and 4 and 4 and 5 consisting of two silvery streaks on a brownish spot circled with yellow; a fine wavy subterminal line, divided by ochreous brown scales near anal angle; the marginal and terminal lines fine.

Expanse.—Forty-four millimeters.

Habitat.—Peru.

Type.—No. 5875, U.S.N.M.

EUPTYCHIA BORASTA, new species.

Diagnosis.—*Male*.—Wings brown, the lines darker; the subterminal nearly straight, parallel to margin; the marginal line similar; the terminal line finer; a large and a smaller black ocellus with silvery points, and broadly circled with ochreous near anal angle of secondaries. Underneath grayish brown, thinly irrorated with darker brown; the inner and outer lines fine, dark brown, shaded with lighter brown toward median space, the former line slightly excurved, the latter faintly incurved on primaries, faintly wavy on secondaries; the space between outer and subterminal lines whitish, divided by a broad brownish shade, becoming ochreous between vein 3 and inner margin on secondaries, and on which are the ocelli; an almost imperceptible ocellus on primaries between veins 5 and 6, on secondaries a black ocellus with silver point and circled with yellow between veins 5 and 6; a minute similar ocellus above vein 6; a black spot with a silver point above

vein 2 and a similar spot below vein 2; these are on the ochreous portion of band and the yellow circle is obsolescent; the subterminal, marginal, and terminal lines as on upper side; fringe brown at base, outwardly grayish.

Expanse.—Forty-five millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 5876, U.S.N.M.

LYMANOPODA VAROLA, new species.

Diagnosis.—Wings brown, faintly tinged with rufous. Underneath similar; some lilacine scales on outer margin, limited by a fine irregular reddish brown line. Primaries, a darker indistinct outer line; a marginal ocellus between veins 2 and 3, black containing a white point and circled with ochreous. Secondaries, an irregular reddish subterminal line followed between veins 2 and 3 by a small round yellow spot.

Expanse.—Thirty-six millimeters.

Habitat.—Peru.

Type.—No. 5877, U.S.N.M.

BRASSOLINÆ.

NAROE MARMORATA, new species.

Diagnosis.—Wings brown, the veins paler; also the basal and anterior portion of primaries to the dark violaceous brown apical portion which does not reach vein 4 on the outer margin. Underneath, primaries fawn color, irrorated with dark brown striae; a narrow inner and a broad median irregular brownish shade; a white shade from apex to middle of inner margin; a white costal spot before apex; a marginal black spot mottled with white scales between veins 5 and 6. Secondaries darker; an oblique violaceous shade from middle of costal margin to near base of inner margin; a similar median shade from vein 5 to middle of inner margin; an outer shade not quite so dark and mottled with lilacine from vein 5 to inner margin and anal angle, containing four subterminal yellow spots edged with reddish brown, the largest spot between veins 2 and 3; the outer margin light brown, limited by a lunular dentate darker brown line.

Another specimen has the upper surface of a more uniform brown, merely the apex and outer margins being slightly darker.

Expanse.—Fifty-eight millimeters.

Habitat.—Bolivia.

Type.—No. 5878, U.S.N.M.

ACRÆINÆ.

ACRÆA OZINTA, new species.

Diagnosis.—Wings deep blue black. Primaries, a roseate basal space confined within the subcostal and submedian veins, and oblique from subcostal to below vein 2. Underneath, primaries duller; the roseate spot on primaries as on upper surface. Secondaries dull black, the veins brilliant black, thinly irrorated with reddish scales; the base and cell yellow, streaked with black.

Expanse.—Forty-eight millimeters.

Habitat.—Venezuela.

Type.—No. 5879, U.S.N.M.

ACRÆA DOGNINI, new species.

Diagnosis.—Wings blue black. Primaries, the cell, a space between veins 2 and 3, and a space below the end of cell and vein 2 bright red, not reaching the submedian; sometimes a subapical reddish transverse line. Underneath, primaries black; the red not so bright and extending to base and inner margin; a subterminal reddish shade consisting of short longitudinal streaks. Secondaries dull black; the costa, base, and inner margin streaked with red; some indistinct streaks on outer portion.

Expanse.—Fifty-two millimeters.

Habitat.—Ambato, Ecuador.

Type.—No. 5880, U.S.N.M.

ACRÆA MITAMA, new species.

Diagnosis.—Wings somewhat transparent, especially the outer margins, fulvous; the outer margins broadly brownish black, with darker streaks between the veins. Primaries, the costa and inner margins narrowly blackish; a transverse black streak in cell from subcostal to vein 2; a broad black streak at end of cell; a short longitudinal black streak below median vein near base; an oblique black shade from costa touching the discocellular at vein 5, incurved below vein 2. Secondaries, the discocellular velvety black followed by a broad curved velvety black line from middle of costa to middle of inner margin. Underneath brownish, thinly scaled, showing the markings of upper surface.

Expanse.—Forty-seven millimeters.

Habitat.—Castro, Parana, Brazil.

Allied to *A. mamita* Burmeister.

Type.—No. 5881, U.S.N.M.

ACRÆA SURIMA, new species.

Diagnosis.—Wings light fulvous brown, the veins black. Primaries, the costal, outer and inner margins narrowly black; the apex broadly black; a black point below median near base; a broad black mark in cell from costa to vein 2, basally excavated; a broad black outer band inclosing discocellular touching outer margin at vein 2, and inwardly dentate below it. Secondaries, the outer margin broadly black, finely toothed between the veins; discocellular black adjoining a short black longitudinal streak in cell; a broad black outer band slightly oblique from middle of costa to vein 4, then curved toward base to below vein 2, where it is angled and diminishes in width to middle of inner margin; two black streaks below cell from base to outer band. Underneath similar, but duller.

Expanse.—Fifty-four millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5882, U.S.N.M.

ACRÆA QUADRA, new species.

Diagnosis.—Secondaries slightly angled at vein 4. Wings light brown, the veins black. Primaries, the costal, inner and outer margins narrowly black, the latter with darker and deeper intervenal streaks; the apex broadly black similarly streaked; an irregular black spot in cell beyond vein 2, not reaching the subcostal; a broad outer oblique band from costa to outer margin at vein 2, inclosing a few light brown scales between veins 2 and 3; a black streak from base to outer margin above submedian vein; a transverse black mark from the middle of vein 2 to inner margin. Secondaries, a short black longitudinal streak in cell; outer margin narrowly black; long black intervenal streaks from near cell to outer margin. Underneath, primaries flesh color, the black margins replaced by greenish buff, streaked with black; the veins black; the discal spot and mark below vein 2 as on upper surface; the outer transverse band black, narrower from vein 7 to 2 near outer margin, inclosing a small pale spot above vein 5. Secondaries greenish buff, the veins and black streaks as on upper surface.

Expanse.—Sixty-four millimeters.

Habitat.—Petropolis, Brazil.

A very distinct species.

Type.—No. 5883, U.S.N.M.

NYMPHALINÆ.

ERESIA CRINA, new species.

Diagnosis.—Primaries roseate; the costa and inner margin finely black; the outer margin broadly, and apical third of wing black; a broad oblique black band from middle of costa to outer margin at

vein 2; this band widest toward costa. Secondaries black; the basal half tinged with drab gray. Underneath, primaries similar but the roseate more delicate in color. Secondaries dark brown, the veins black; streaks of dark reddish scales at base of costa in cell and along the inner margin.

Expanse.—Forty-one millimeters.

Habitat.—Ecuador.

Type.—No. 5884, U.S.N.M.

PHYCIODES FELLULA, new species.

Diagnosis.—Wings above black, markings white. Primaries, a small spot at end of cell; beyond cell a geminate spot divided by vein 6; a large spot on inner margin at two-thirds from base, and a similar spot above vein 2 a little closer to margin; a large subterminal white spot between veins 4 and 5; two minute spots near costa before apex; fringe spotted with white at apex, and between veins 4 to 6. Secondaries, a broad median white band, cut by black veins; a faint, fine, subterminal reddish line. Underneath, primaries; the basal half olivaceous gray, the outer half blackish; the spots as above; the discal spot much larger, bordered with black; a white space at apex, and on outer margin between veins 4 to 6, cut by a wavy subterminal geminate dark line. Secondaries, the basal two-thirds white, the outer third brownish; some irregular anular spots on basal half, light brown, and a darker brown spot at end of cell; the median white band containing minute brown specks on veins; a subterminal row of deep black spots partly edged with white; marginal white lunules.

Expanse.—Thirty-three millimeters.

Habitat.—Colombia.

Allied to *P. ianthe* Fabricius.

Type.—No. 5885, U.S.N.M.

PHYCIODES SEJONA, new species.

Diagnosis.—*Female*.—Primaries black-brown, spotted with light reddish brown; the spots on basal half small and darker; an oblique streak from costa at two-thirds to vein 4; two small spots beyond, between veins 4 and 6; a large space on inner margin before angle to vein 3, cut by a fine transverse dark line; some marginal reddish brown shadings widest between veins 3 and 4. Secondaries bright reddish brown; the base and costa blackish; an outer black band from inner margin to vein 6; the margin black; the space between divided by a black lunular line; fringe grayish white. Underneath, primaries fulvous, the dark markings of upper side replaced by reddish brown, except a submarginal band from vein 4 to inner angle, which is black; a lilacine patch before apex; a fine marginal line. Secondaries, the basal two-thirds and apex lilacene, irrorated with reddish brown; the

outer portion from inner margin to vein 5 brownish; a fine irregular inner and an outer brown line; a median similar line, inclosing a fulvous discal spot; subterminal dark points below vein 5; a dark marginal lunular line.

Expanse.—Thirty-five millimeters.

Habitat.—Sao Paulo, southeast Brazil.

Type.—No. 5886, U.S.N.M.

PHYCIODES BRANCODIA, new species.

Diagnosis.—Wings brown irrorated with fulvous scales at the base, and spotted with paler fawn color. Primaries, a small discal spot in cell; a much larger one near end of cell; a spot below each of these above the submedian; a fulvous streak on discocellular; four spots between vein 4 and submedian, the lower two the smallest; slightly beyond these spots from veins 4 to 7, and two above inner margin, above and below vein 2; two subterminal spots between veins 4 to 6 and a smaller one on costa; a marginal spot between veins 3 and 4. Secondaries, a basal spot on costa, one in cell, and another below it; a large spot at end of cell followed by a fulvous crescent; four small spots from vein 4 to costa; a broader band from near inner margin to vein 7, cut by the black veins, followed by a darker irregular line, also cut by the veins, and a row of somewhat lunular spots; fringe white, spotted with brown at veins. Underneath, basal half of primaries whitish, crossed by a broad basal inner and median yellowish band partly bordered with dark brown; the outer half black, the spots as above, but larger and white; a pale marginal space from veins 2 to 4; some lilacine and brownish mottlings at apex; a marginal fine wavy dark line. Secondaries whitish irrorated with fulvous; a wavy basal geminate inner and geminate outer fine reddish brown line; a brown patch beyond the latter on costa; a smaller brown patch beyond the cell; subterminal spots black between veins 2 and 5, otherwise reddish brown; a geminate marginal lunular line, partly shaded with lilacine and light brown.

Expanse.—Thirty-two millimeters.

Habitat.—Sao Paulo, southeast Brazil.

Allied to *P. tulcis* Bates.

Type.—No. 5887, U.S.N.M.

PHYCIODES ORTICAS, new species.

Diagnosis.—*Male*.—Primaries, a small pale spot near end of cell; a small oblique whitish band from above vein 4 to just above vein 6; a larger whitish spot at two-thirds from base from just below vein 2 to just above vein 3. Secondaries, a broad whitish transverse band from inner margin to vein 7, somewhat yellowish between 6 and 7, and on inner margin; a marginal fine lunular grayish-brown line. Under-

neath, basal half of primaries reddish brown; the discal spot larger and partly edged with reddish brown; the oblique band reaching costa, and preceded by a broad black shade which borders the large spot above inner margin; the outer margin brown; a marginal fine darker line; some white at apex. Secondaries, the basal two-thirds whitish crossed by fine irregular brownish lines, partly geminate and filled in with lilacine; the outer third light brown; the subterminal points small, darker brown, followed by a fine lunular reddish-brown line and parallel to it a marginal grayish lunular line.

Expanse.—Thirty-five millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5888, U.S.N.M.

PHYCIODES CARIGIA, new species.

Diagnosis.—Primaries, basal half rich brown with a basal and a geminate inner transverse wavy black line; an oblique ocherous spot at end of cell edged with black; outer half black with ocherous spots; a large spot at vein 3 extending slightly below vein 2; an oblique row of spots from costa to vein 4; a large subterminal spot above inner margin, another slightly smaller between 4 and 5, and a fine curved spot on costa; an irregular marginal line, broken by veins, and enlarging between veins 3 and 4, obsolescent between 5 and 6. Secondaries, cell and below it rich brown; costa and outer margin black; a broad median ocherous band to vein 7; the inner margin brown irrorated with yellow; an ocherous outer line from inner margin to vein 4; a marginal lunular ocherous line from anal angle to apex. Underneath the spots on primaries are yellowish white and larger; the outer margin dark reddish brown crossed by a fine dark line; some gray at apex; the basal half yellowish white with a large irregular annular mark; on the inner margin and between the large spots black. Secondaries, basal half whitish with large buff spots outlined with reddish brown; a median brown line followed by a small dark space on costa; a pinkish white space between veins 2 and 6; outer margin broadly gray mottled with fulvous; the extreme margin reddish brown; a darker geminate marginal lunular line.

Expanse.—Thirty-six millimeters.

Habitat.—Colombia.

Type.—No. 5889, U.S.N.M.

ADELPHA GOYAMA, new species.

Diagnosis.—Wings dark brown; a terminal, marginal, and subterminal darker line, all rather broad, and the subterminal geminate on secondaries. Primaries, four transverse darker lines in cell, and two below it; a median white band from inner margin to just above vein

2, surmounted by a large fulvous space outwardly limited by the subterminal, and becoming narrower above vein 5, from which point to costa near apex are three small fulvous spots. Secondaries, a broad median white band from costa to near anal angle; a fulvous spot at anal angle. Underneath primaries, costa gray streaked with white and reddish at base; cell lilacine white at base with an upwardly oblique reddish streak from median vein; four reddish transverse lines, the space between the first two and last two grayish brown, between the second and third lilacine; the base below cell and a narrow space beyond it, grayish brown; the white median band extending to costal margin, but tinged with reddish brown above vein 3, outwardly limited by a reddish brown line, which is followed on costa by a quadrate dark brown space, and then three whitish spots, and on inner margin by a dark grayish space to vein 2; the space between 2 and 5 whitish, tinged with reddish; a subterminal grayish line; the outer margin tinged with gray and whitish; a marginal reddish brown line; the apex and extreme margin tinged with reddish brown. Secondaries, whitish gray at base; a basal reddish line from costa along inner margin; a geminate reddish inner line, coalescing at veins forming three elongated spots; the white median band broadly edged with reddish brown; the space beyond grayish brown, divided by a heavy reddish brown line, and limited by a darker gray line; the outer margin grayish white; a marginal and a terminal reddish brown line; two small black crescents surmounted by bright reddish brown near anal angle.

Expanse.—Forty-three millimeters.

Habitat.—Castro, Parana, Brazil.

Allied to *A. erotia*; also in the collection of Godman from Paraguay.

Type.—No. 5890, U.S.N.M.

ADELPHA BARNESIA, new species.

Diagnosis.—Wings brown; terminal, marginal, and subterminal darker lines, the latter geminate on secondaries. Primaries, fine darker brown lines crossing the cell and one beyond it; the first line continued to submedian, the second line forming an 8 below the median; a white median band from inner margin to vein 3; a broad fulvous space above vein 3, excavated on its basal side at vein 4, and excavated anteriorly below vein 6, outwardly followed to costa by two minute fulvous spots. Secondaries, a broad white median band terminating above the anal angle, which is rather produced; a fulvous spot close to anal angle; underneath lilacine, the lines reddish brown. Primaries, an oblique streak at base of cell; four transverse lines forming two spots; a similar spot below the cell; the white median band as above; the fulvous replaced by a dull whitish space cut into spots by the reddish veins, followed on costa and inner margin by a violaceous brown space; the lilacine outer margin divided by a reddish

brown line. Secondaries, a streak at base, geminate and diverging below the cell; a geminate streak from vein 8 to median vein, forming an elongate spot; the white median band inwardly edged with reddish brown, outwardly with violaceous brown; the inner portion of subterminal broad, reddish brown, the outer portion fine, violaceous; the marginal line reddish brown; the terminal line black.

Expanse.—Fifty millimeters.

Habitat.—Bolivia.

Near *A. pleuraure* Hübner.

Type.—No. 5891, U.S.N.M.

CHLORIPPE LAURONA, new species.

Diagnosis.—*Male*.—Allied to *C. laure* Drury. The wings have the same dark violet gloss; the orange band of the primaries is broader and reaches the apex and outer half of costa.

Female.—Primaries, the anterior and outer portion of the white band is edged with fulvous, and is outwardly surmounted above vein 4 by a large fulvous space, which does not reach apex.

Expanse.—Male, 56 millimeters; female, 65 millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 5892, U.S.N.M.

Family LYCÆINDÆ.

ERYCININÆ.

EURYGONA CUCUTA, new species.

Diagnosis.—Primaries dark brown; a large dark red space on inner margin extending slightly into cell and along vein 3, not reaching the outer margin; a short red streak at base of cell below subcostal. Secondaries dark red, the costal and the inner margins brown. Underneath brownish gray; a reddish median line edged with black, curved near inner margin of secondaries; a narrow brownish subterminal shade. Secondaries, the outer margin light brown; a black spot outwardly edged with white between veins 3 and 4; two yellowish streaks mottled with black and terminating in white spots below vein 2; a similar streak above anal angle; the extreme margin darker, ochereous below vein 2.

Expanse.—Twenty-two millimeters.

Habitat.—Cucuta, Venezuela.

Type.—No. 5893, U.S.N.M.

EURYGONA MICAELA, new species.

Diagnosis.—Wings dark violaceous brown. Primaries, a large fulvous patch beyond the cell from vein 2 to above vein 4, not reaching outer margin. Underneath light brown; a median reddish brown line, shaded with black near costa of primaries, curved close to inner

margin of secondaries, a larger subterminal shade, lunular on primaries, broken into spots on secondaries, containing two black points between veins 3 and 4; a faint dark outer shade.

Expanse.—Thirty-two millimeters.

Habitat.—Peru.

Type.—No. 5894, U.S.N.M.

EURYGONA RASONEA, new species.

Diagnosis.—Wings dark brown, the outer margin of primaries below vein 5 and the secondaries from below apex to vein 2 shot with dark metallic blue. Underneath light reddish brown. Primaries, a darker subterminal shade; an outer darker band edged with duller brown oblique from middle of costa to below vein 2. Secondaries, a darker outer band as on primaries, straight from costa to vein 4, then starting more outwardly, wavy, and curved to inner margin, followed by longitudinal reddish brown streaks between the veins; these streaks not reaching the outer margin and terminating in black points outwardly shaded with white; a marginal black spot between 3 and 4, outwardly shaded with white, inwardly with reddish brown; above this spot to apex the outer margin is broadly darker.

Expanse.—Thirty millimeters.

Habitat.—Cucuta, Venezuela.

Allied to *E. enoras* Hewitson.

Type.—No. 5895, U.S.N.M.

EURYGONA TARINTA, new species.

Diagnosis.—Wings dark brown; the outer half of primaries and the outer margin of secondaries narrowly shot with dark metallic blue. Underneath dull orange. Primaries, a straight darker outer line; a broad darker subterminal shade; the inner margin gray. Secondaries, the outer line of primaries forming a median line, straight, only curved close to inner margin; the outer margin broadly darker, forming streaks below vein 3, terminating in black points; a large black spot between veins 3 and 4, outwardly shaded with white, inwardly with ochereous; a black marginal point below vein 6 and another above it.

Expanse.—Thirty-five millimeters.

Habitat.—Colombia.

Allied to *E. eupiola* Hewitson.

Type.—No. 5896, U.S.N.M.

MESOSEMIAT MATHANIA, new species.

Diagnosis.—Wings brown. Primaries, a large round black spot at end of cell containing a large and a smaller white point; the ocellus preceded and followed by two fine dark brown lines to inner margin; the two inner lines not reaching costa and preceded below the median

vein by a third line; a broad dark brown subterminal shading, slightly curved and widest on costa, followed by a blackish line somewhat interrupted by the veins. Secondaries, three much darker lines; a broader median shade containing a black discal point; three outer lines; a broad subterminal, followed by a blackish line as on primaries. Underneath paler, the markings similar, only the lines curve round and meet above the ocellus on the primaries; on the secondaries the marginal black line thickens between veins 2 and 3.

Expanse.—Twenty-nine millimeters.

Habitat.—Peru.

Type.—No. 5897, U.S.N.M.

MESOSEMIA FRIBURGENSIS, new species.

Diagnosis.—Wings dark blackish brown with still darker lines; a straight inner line, indistinct on secondaries, followed by a finer, paler line curving around the ocellus and returning to the inner margin of secondaries; the outer line heavily marked, distinct, nearly straight on both wings; the subterminal shade broad, especially on costa of primaries; a fine marginal line, interrupted by the veins; the ocellus black with a white point. Underneath paler; the inner and outer lines most distinct; the inner line more wavy than on the upper side; on primaries a dark median spot below vein 2; on secondaries a small geminate dark discal spot; the subterminal shade somewhat lunular and toothed.

Expanse.—Twenty-nine millimeters.

Habitat.—Nova Friburgo, Brazil.

Allied to *M. rhodia* Godart.

Type.—No. 5898, U.S.N.M.

LYMNAS (?) PELTA, new species.

Diagnosis.—*Male*.—Body black; a transverse orange line on head; anal hairs orange. Wings violaceous black; greenish brown streaks between the veins. Primaries, a broad orange band from middle of costal margin to inner angle. Underneath black; the intervenal streaks lighter. Primaries, base of costa orange; the transverse band paler. Secondaries, a yellow spot at base; a small orange spot close to anal angle.

Female.—The band on primaries much narrower. Secondaries, a marginal orange band outwardly edged with black. Underneath similar.

Expanse.—Male, 35 millimeters; female, 37 millimeters.

Habitat.—Nova Friburgo, Sao Paulo, Brazil.

Type.—No. 5899, U.S.N.M.

SYMMACHIA EURINA, new species.

Diagnosis.—Wings orange red. Primaries, outer margin narrowly black; base finely black; base of costa finely black, widening and forming a broad streak which extends obliquely into cell to near lower angle, followed by a white space; beyond this to apex the costa is finely black and is joined by a thick black discocellular streak followed by a curved white line, and another short black streak from vein 5 to costa, and from this last a black streak extends above vein 6 to costa near apex, inclosing a small white spot on costa. Secondaries, the outer margin and anal third of inner margin black, broader than on primaries. Underneath the same.

Expanse.—Twenty-four millimeters.

Habitat.—Castro, Parana, Brazil.

Allied to *S. rubina* Bates.

Type.—No. 5900, U.S.N.M.

SYMMACHIA SATEMA, new species.

Diagnosis.—Wings very dark olivaceous brown with still darker markings, all interrupted by the veins; marginal dark spots; a sub-terminal shade; the outer line incurved below cells, irregular; discocellular streaks; two inner lines and a basal line. Underneath similar, but somewhat paler.

Expanse.—Twenty-four millimeters.

Habitat.—Petropolis, Brazil.

Allied to *S. temesa* Hewitson.

Type.—No. 5901, U.S.N.M.

EUCORA, new genus.

Diagnosis.—*Female*.—Primaries broad; costa convex toward apex; apex acute; discocellular inwardly curved; veins 3 and 4 well apart; 4 from lower angle of cell; 5 from above middle of discocellular; 7 and 8 stalked; 10, 11, 12 equally distant apart from before end of cell. Secondaries long; discocellular obliquely straight; veins 2, 3, and 4 equally distant apart, 5 from near upper angle of cell; 6 and 7 from a point.

Type of genus.—*Eucora sanarita* Schaus.

EUCORA SANARITA, new species.

Diagnosis.—Primaries black, irrorated with pale blue between the veins; a large white space at end of cell bordered on either side by a broad black band; beyond cell from veins 3 to 6 the intervenal spaces are also whitish; apex broadly, outer margin more narrowly black; a marginal geminate blue line, interrupted by veins, simple at apex, and preceded between veins 6 and 7 by a large white spot. Secondaries similar; the costal margin blackish; a marginal white spot between

5 and 6; the cell and space between veins 4 and 5 whitish; underneath more whitish, and less blue on margins.

Expanse.—Forty-two millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 5902, U.S.N.M.

CHARIS INCOIDES, new species.

Diagnosis.—*Male*.—Wings dark brown with blackish lines not reaching the costa; two inner lines, interrupted by veins and most noticeable in and below the cells; a dark discocellular streak on primaries; the outer line irregular; marginal dark points between the veins, and slight clusters of silvery scales near tips of veins; a terminal dark line; fringe paler brown; underneath light brown; the dark lines broken into spots; no metallic scales near margins; some white marks on fringe.

Female.—Wings lighter brown than in the male; the lines more distinct; the outer margin shaded with pale reddish brown, in which the dark spots are very distinct, the metallic scales forming streaks on tips of veins; underneath fawn-colored; the markings very distinct; traces of a subterminal darker shade; the white marks on fringe of primaries very distinct.

Expanse.—Male, 17 millimeters; female, 18 millimeters.

Habitat.—Peru.

Type.—No. 5903, U.S.N.M.

CHARIS DUKINFELDIA, new species.

Diagnosis.—Body black; collar and a lateral streak on abdomen dark orange red; wings, brownish black. Primaries, an oblique orange red band from costa across discocellular to median vein; another similar band from costa, near apex, to outer margin above inner angle. Secondaries, an orange red subterminal band, widest near anal angle. Underneath similar, with traces of darker transverse shades.

Expanse.—Twenty millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5904, U.S.N.M.

CHAMAELIMNAS JOVIANA, new species.

Diagnosis.—Body black; collar yellow; wings black. Primaries a broad bright yellow streak from base through cell, angled above discocellular, and extending to near outer margin between veins 3 and 4. Secondaries a broad bright yellow streak from base, chiefly below cell, to near outer margin between veins 4 and 5. Underneath similar.

Expanse.—Twenty-eight millimeters.

Habitat.—Peru.

Type.—No. 5905, U.S.N.M.

CHAMAELIMNAS SIMILIS, new species.

Diagnosis.—Body and primaries as in *C. joviana* Schaus. Secondaries black; a few yellow scales on median vein.

Expanse.—Twenty-four millimeters.

Habitat.—Peru.

In a good series of both this and *C. joviana* I find no intermediate forms, and therefore consider them distinct, though closely allied.

Type.—No. 5906, U.S.N.M.

MESENE STRIGULATA, new species.

Diagnosis.—Body orange above, brown below. Wings orange, the margins and fringe narrowly black. Primaries, the costa broadly brown; a short black discocellular streak, a black point beyond touching the brown costal margin. Underneath duller; the basal two-thirds crossed by black lines and spots.

Expanse.—Twenty-one millimeters.

Habitat.—Petropolis, Brazil.

Allied to *M. simplex* Bates.

Type.—No. 5907, U.S.N.M.

MESENE MARTHA, new species.

Diagnosis.—Body black; wings bright crimson, the outer margin and fringe broadly black. Primaries, the costal margin black extending into cell on its basal half and reaching inner margin; a thick black discocellular mark not reaching lower angle of cell. Underneath, primaries brownish black, the outer margin darkest; the inner margin yellowish streaked anteriorly with red; a white marginal spot between veins 3 and 4; a darker discocellular streak. Secondaries bright crimson; outer margin black with two small white spots, one below vein 2, the other above vein 3; the base brown; the costal and inner margins finely brown.

Expanse.—Twenty-six millimeters.

Habitat.—Peru.

A specimen which may belong here is of a duller red, the margins very narrowly black. Underneath the red streak on primaries above the inner margin is broader and extends to cell at its lower angle; the body is crimson.

Type.—No. 5908, U.S.N.M.

BAEOTIS BACÆNITA, new species.

Diagnosis.—Body black above; abdomen white below; a yellow lateral stripe. Wings blackish; a yellow basal line from subcostal on primaries to inner margin of secondaries; a broad median yellow space starting in a point at subcostal, widening at vein 3, then remaining

broad to the inner margin of secondaries, which is also yellow; a subterminal darker yellow line, not reaching costa of primaries, slightly interrupted at vein 2, preceded on secondaries near costal and inner margins by some silvery scales; a marginal silvery line; fringe brown divided by a darker line. Underneath the yellow markings are still broader and there are no silvery scales on lines.

Expanse.—Twenty-one millimeters.

Habitat.—Peru.

Allied to *B. baccaenis* Hewitson.

Type.—No. 5909, U.S.N.M.

CALYDNA ZEA, new species.

Diagnosis.—*Male*.—Primaries, black; a few bluish scales on outer margin; some transparent opalescent spots; a small one in middle of cell; a large quadrate spot at end of cell; a small spot beyond end of cell above vein 8, and another smaller one beyond it between veins 7 and 8. Secondaries black; the outer margin broadly pale blue containing some small black spots. Underneath dark brownish gray; yellow streaks and spots on costa of both wings. Primaries, some black spots in cell and below it; the median space between cell and submedian shaded with dark red; an outer row of black spots partly shaded with dark red; subterminal smaller black spots partly shaded with white. Secondaries with black spots as on primaries, and reddish mottlings above the cell.

Female.—Primaries, the small white spots as in the male; the large spot at end of cell smaller and irregular; wings dark brown; the costa with thick light red striæ; inner, median, and outer irregular black bands edged with dark red; large subterminal dark red spots containing black spots, somewhat confluent. Secondaries with the bands as on primaries; some minute transparent spots in cell, also one near base of inner margin, and another on costal margin beyond the outer band. Underneath similar but more brightly colored.

Expanse.—Male, 25 millimeters; female, 22 millimeters.

Habitat.—Peru.

Type.—No. 5910, U.S.N.M.

CARIA TABRENTIA, new species.

Diagnosis.—Wings brown, irrorated with metallic green scales. Primaries, a broad inner space devoid of green scales, and crossed by a darker line; a marginal metallic steel blue line interrupted by a red spot at apex, and followed by a dark brown line. Secondaries, a marginal green line followed by dark points between the veins. Underneath dark violaceous gray; a darker wavy outer line; some basal spots, and median line, geminate in cell of secondaries. Primaries,

some silvery scales at base of costa, at apex, before apex, and in cell; a large silvery spot at end of cell.

Expanse.—Twenty-one millimeters.

Habitat.—Peru.

Type.—No. 5911, U.S.N.M.

APODEMIA MULTIPLAGA, new species.

Diagnosis.—Wings above dark blackish brown; the fringe white with brown blotches; the spots white. Primaries, a small spot in cell followed by a large spot at end of cell; a small spot near base above submedian, and a large one below origin of vein 2; a large spot between veins 2 and 3; a small spot between 3 and 4; a row of five spots from costa to vein 4; marginal black points between the veins, preceded above vein 4 by small white spots. Secondaries, a small and a large spot in cell; two small spots below cell; a row of four small spots from costa to vein 4; small subterminal white spots and indistinct marginal whitish spots. Underneath, primaries dark gray; the spots as above, slightly larger; the cell and just below it bright ochereous; the outer margin whitish with intervenal black points. Secondaries, lilacine white; a median brown costal patch followed and preceded by a black spot; a broad subterminal dark gray shade spotted and streaked with black; marginal black spots shaded with white.

Expanse.—Thirty-two millimeters.

Habitat.—Rinconada, Mexico.

A very distinct species.

Type.—No. 5912, U.S.N.M.

HAMEARIS DOVINA, new species.

Diagnosis.—*Female*.—Wings bright rufous brown. Primaries, a black spot at end of cell, preceded by a small dark brown spot in cell; some olivaceous shading at base of wings; a broad blackish band from costa angled beyond cell, narrowing and indistinct below vein 3, and followed above vein 6 by a whitish spot; a blackish subterminal band, hardly visible below vein 2, and connected to the black outer margin by a black streak on veins, forming large marginal rufous brown spots. Secondaries, a black median and apical patch on costa; small dark marginal spots between the veins; a terminal black line; tips of veins blackish. Underneath, primaries light rufous brown; the costa, apex, and outer margin grayish; three white spots in cell before discocellular, which is broad, divided by a rufous line and followed by another white spot; three white spots below the cell; an outer row of black spots and subterminal black spots below vein 4. Secondaries olivaceous gray; an inner white band interrupted by veins; an outer white band from costa to vein 4, irregular and indistinct from vein 4 to inner margin; subterminal paler, lunular.

Expanse.—Thirty-four millimeters.

Habitat.—Bolivia.

Allied to *H. erostratus* Doubleday.

Type.—No. 5913, U.S.N.M.

LEPRICORNIS TRISTIS, new species.

Diagnosis.—Body black; palpi orange; some orange laterally behind head. Primaries black, with grayish streaks in cell, below it, and below vein 3; an oblique transverse white band from below costa to vein 3, near outer margin. Secondaries black, with grayish streaks between the veins; underneath similar.

Expanse.—Thirty-five millimeters.

Habitat.—Peru.

Type.—No. 5914, U.S.N.M.

LEMONIAS MALCA, new species.

Diagnosis.—Body black above, the abdomen posteriorly irrorated with white; underneath whitish. Primaries dark brown, with blackish spots; two inner rows partly circled with buff; an irregular outer row. A discocellular spot; a marginal row of spots partly preceded and followed by a lilacine line. Secondaries, the basal third of inner margin, the cell, costal margin, and outer margin above vein 4 dark brown, otherwise white; the dark portion spotted as on primaries; the white portion with a terminal dark line; a dark point above vein 2, and another near anal angle. Underneath primaries light brown, all the spots circled with white except the outer row, which are velvety black. Secondaries white, shaded with lilacine gray at base and along costal margin; a few spots along costa and at apex.

Expanse.—Twenty-four millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5915, U.S.N.M.

ITHOMEIS LAURONIA, new species.

Diagnosis.—Body black; head spotted with white; a lateral red stripe on abdomen. Wings thinly scaled, grayish; the veins black. Primaries, costa, inner margin, and apical portion from beyond cell to inner angle brownish black; a dull reddish brown streak on costa at base; a similar streak from base above submedian vein to inner angle, then along outer margin and curving before apex to costal margin; between this and cell an oblique white band from costa to vein 3. Secondaries, the costa and outer margin brownish black, with a reddish brown streak as on primaries. Underneath brighter; the reddish costal streak on primaries extending from base to oblique white band; the veins crossing black portion between cell and white oblique band also reddish.

Expanse.—Forty-one millimeters.

Habitat.—Peru.

Allied to *S. satellites* Bates.

Type.—No. 5916, U.S.N.M.

STALACHTIS SONTELLA, new species.

Diagnosis.—Head black spotted with white. Abdomen reddish brown; a sublateral black streak banded with white. Wings black. Primaries, basal third reddish brown, with a small white point in cell and another below it; a broad marginal reddish brown space from near costa to just below vein 2; the dark median space with a row of white points outwardly curved from costa, incurved below discocellular white point; large white spots on fringe. Secondaries, a small reddish brown space at base; a broad marginal space also reddish brown; a row of white points below vein 6 beyond cell; a white point in cell and two below it; some white points on black outer margin; white spots on fringe. Underneath the reddish brown is much extended, leaving the black median space quite narrow; the white spots are larger and more numerous; there is also a subterminal row of white points on the reddish portion.

Expanse.—Thirty-three millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5917, U.S.N.M.

STALACHTIS STELLIDIA, new species.

Diagnosis.—Head black streaked with white. Collar and a spot anteriorly on patagiæ reddish-brown. Abdomen reddish-brown; a sublateral black streak banded with white. Wings black; fringe black with quadrate white spots; a few marginal whitish spots; a subterminal reddish-brown band not quite reaching the costal and inner margins, preceded by a curved irregular outer row of small white spots; two median white spots, and another nearer the base on both wings. Primaries, one-third of cell and costal margin from base, reddish-brown. Underneath primaries similar, but the white spots all much larger; two extra white spots in cell; a basal spot below median; two white dashes beyond discocellular; a row of small white spots on inner side of subterminal band. Secondaries with the cell reddish-brown; the spots as on primaries; some extra white spots on costa.

Expanse.—Thirty-five millimeters.

Habitat.—Sao Paulo, southeast Brazil.

Type.—No. 5918, U.S.N.M.

LYCÆNINÆ.

LYCÆNA GRIQUA, new species.

Diagnosis.—Wings olivaceous gray; a small darker discocellular streak; outer margin darker showing indistinctly before it the markings of under surface; fringe whitish spotted with dark-gray. Underneath olivaceous buff; spots black edged with buff; a marginal dark-gray line; marginal small dark gray spots; subterminal spots more distinct on primaries. Primaries, a black spot at end of cell; an outer row of larger black spots. Secondaries, two small basal spots on inner margin; a row of four black inner spots; a pale spot at end of cell; an outer row of seven black spots, the third from costa nearest the outer margin.

Expanse.—Twenty millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5919, U.S.N.M.

LYCAENA COGINA, new species.

Diagnosis.—*Male*.—Primaries lilacine white, irrorated with black at base; costa, apex, and outer margin broadly grayish black. Secondaries lilacine white; the base irrorated with blackish scales; costa broadly dark gray; a terminal black line; dark marginal spots between the veins; subterminal triangular dark gray shades. Underneath, grayish white; a terminal dark line; dark marginal triangular spots. Primaries, a dark spot at end of cell; an outer row of dark gray spots surrounded by purer white and followed by darker dashes between the veins; a subterminal row of dark lunular spots. Secondaries, the spots circled with purer white; two dark gray spots on costa; three inner spots, one in cell, one below, and one on inner margin; a line at end of cell; an outer row of spots, very indistinct, followed by irregular gray shades; the subterminal dark consisting of angular lines.

Expanse.—Twenty-two millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5920, U.S.N.M.

THECLA GIAPOR, new species.

Diagnosis.—Body blue above, whitish below. Primaries, metallic blue in cell to brand and just above vein 2, and the space below base to near outer margin, otherwise black; the brand brown, followed by a smaller gray brand; fringe light reddish brown. Secondaries, metallic blue; the costa narrowly at base, and apex to below vein 6 black; the outer margin narrowly black; a single fine tail; fringe as on primaries. Underneath gray, palest beyond outer line; a fine dark discocellular streak; the extreme margin light brown; a subterminal dark gray line, slightly wavy, interrupted by veins; base of fringe

reddish. Primaries, a slightly oblique dark brown outer line from costa to vein 2, inwardly shaded with reddish secondaries; a fine dark inner line, interrupted, not reaching inner margin; the outer line dark red, nearly straight from costa to vein 4, then irregular and angled near inner margin; a red marginal point between veins 2 and 3; a small red anal spot and a reddish line shaded with black along inner margin to outer line.

Expanse.—Twenty-six millimeters.

Habitat.—Sao Paulo, southeast Brazil.

Type.—No. 5921, U.S.N.M.

THECLA XOREMA, new species.

Diagnosis.—*Male*.—Primaries, dull metallic blue in cell posteriorly, and below it along vein 2 to near outer margin, otherwise black. Secondaries, dull metallic blue; the costa broadly, the outer margin narrowly blackish; a terminal deep black line. Underneath gray; a terminal black line; a subterminal row of dark gray spots between the veins; a dark discocellular streak; the outer line black, inwardly shaded with red. Primaries, the outer line wavy from costa to vein 5, then straight to vein 2. Secondaries, the outer line broken into spots, those above costa, between 4 and 5 and 2 and 3, placed more outwardly; a red marginal spot with a black point between veins 2 and 3; some red scales at anal angle.

Expanse.—Twenty millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5922, U.S.N.M.

THECLA CARLA, new species.

Diagnosis.—*Male*.—Wings dark violaceous blue. Primaries, costa, apex broadly and outer margin black, the outer margin narrowly black. Underneath bright green; fringe reddish brown. Secondaries, a marginal red point between veins 2 and 3; a faint irregular reddish outer line; fringe black and white at anal angle. Secondaries, evenly rounded without tails.

Expanse.—Nineteen millimeters.

Habitat.—Colombia.

Type.—No. 5923, U.S.N.M.

THECLA NUGAR, new species.

Diagnosis.—*Male*.—Primaries, a small oval light brown brand at end of cell anteriorly; wing dark brown. Secondaries, violaceous metallic blue; the costal margin very broadly dark brown; a terminal dark line; a red spot at anal angle; a white marginal line between vein 2 and anal spot. Underneath gray; a subterminal brownish shade; an outer brownish line outwardly shaded with white. Primaries, outer line from

costa to vein 2, more inwardly from vein 2 to submedian; band visible through wing. Secondaries, the outer line placed more outwardly between 4 and 6, angled on submedian; a marginal red spot and black point between veins 2 and 3, and at anal angle; a terminal dark line inwardly shaded with whitish.

Expanse.—Twenty-one millimeters.

Habitat.—Jalapa, Mexico.

Type.—No. 5924, U.S.N.M.

THECLA ATRANA, new species.

Diagnosis.—*Male*.—Wings brown. Secondaries, a broad marginal fulvous band from inner margin to vein 5. Underneath pale grayish brown; a terminal dark line. Primaries, three outer spots from veins 2 to 5 brown, outwardly shaded with white. Secondaries, a black, partly lunular outer line outwardly edged with white, inwardly broadly shaded with vermilion red; subterminal, black, lunular, outwardly curved, inwardly shaded with white, and broadly followed by vermilion red reaching extreme margin at veins, leaving terminal brownish lunules, this extending from vein 5 to inner margin; a terminal black line.

Expanse.—Twenty-one millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5925, U.S.N.M.

THECLA TALAMA, new species.

Diagnosis.—Wings black. Secondaries faintly tinged with dark blue; a terminal white line below vein 4; a white spot on inner margin just above angle. Underneath, pale grayish brown; a dark discocellular streak, outwardly edged with buff. Primaries, a straight, dark brown, outer line from costa to vein 2, outwardly edged with whitish; a darker subterminal shade, inwardly shaded with buff. Secondaries, outer line dark red edged with black and then white, outwardly oblique from costa to vein 7, then straight to vein 4, inwardly dentate below vein 3, and below 2, outwardly dentate on submedian; subterminal shade darker brown, shaded with whitish from costa to vein 4, then black, close to outer line to inner margin, followed by red at anal angle, between 2 and 3 and close above 3; an anal black spot; a black space irrorated with white below vein 2; a black, marginal point between 2 and 3; a terminal black line inwardly edged with white.

Expanse.—Seventeen millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 5926, U.S.N.M.

THECLA NORMAHAL, new species.

Diagnosis.—Wings brown. Primaries, the costa finely fulvous; lilacine hairs on the inner margin. Secondaries, on inner half of inner margin lilacine white hairs; a terminal black line preceded by a lilacine white line; fringe buff; a red spot at anal angle. Underneath, light grayish brown; a dark discocellular streak outwardly bordered with white; a dark terminal line. Primaries, a broad, straight, outer band from costa to vein 2, dark brown outwardly edged with black; a subterminal dark shade; marginal darker spots between the veins. Secondaries, an outer, dark brown band outwardly edged with black and then partly with white, irregular, placed more inwardly between veins 6 and 7, and 3 and 4, angled at vein 2, and on submedian; a black anal spot surrounded by orange and followed by a dark space irrorated with white; an orange marginal spot with a black point between veins 2 and 3; a whitish, subterminal shade; gray marginal spots shaded with white above vein 3; terminal line inwardly edged with white.

Expanse.—Twenty-one millimeters.

Habitat.—Peru.

Type.—No. 5927, U.S.N.M.

THECLA MALTA, new species.

Diagnosis.—Wings, above, brown. Secondaries, a terminal black line; a dark-red anal spot; wing somewhat angled at vein 6. Underneath, pale olivaceous brown; a dark discocellular line outwardly edged with buff; fringe dark gray. Primaries, an outer blackish line outwardly edged with gray from costa to vein 2; a dark subterminal line from veins 2 to 4. Secondaries, the outer line fine, dark red outwardly edged with black, and then with white, straight from costa to vein 4, inwardly dentate between 2 and 3, inwardly curved below 2, then straight to inner margin; the deep curve below vein 2 filled with dark red; subterminal line lunular, brown, from costa to vein 4, then black and close to outer line, outwardly shaded with red between veins 3 and 4, more deeply shaded with red between 2 and 3, and containing a black marginal spot; below 2 followed by a dark space irrorated with white, and on inner margin shaded with red followed by a black anal spot; terminal line black preceded by a white line.

Expanse.—Twenty-five millimeters.

Habitat.—Peru.

Type.—No. 5928, U.S.N.M.

THECLA VOMIBA, new species.

Diagnosis.—*Male*.—Primaries, the cell and inner margin to just above submedian vein to near outer margin brilliant metallic blue; otherwise black; a darker shade at end of cell. Secondaries brilliant

metallic blue; the apex and outer margin narrowly black; fringe black at base, outwardly whitish. Underneath gray; a terminal darker line inwardly shaded with white; subterminal dark gray, lunular, shaded on either side with white. Primaries, the outer line dark brown, outwardly shaded with white, wavy from below costa to vein 2, preceded below 2 by a grayish line. Secondaries, an inner black line, inwardly bordered with white, outwardly with dark red interrupted above and below cell; the outer line black, inwardly bordered with red, outwardly with white, irregular, angled near inner margin; a red marginal spot with black point between veins 2 and 3; a black point with a few red scales, and a black line above it at anal angle.

Expanse.—Twenty-two millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 5929, U.S.N.M.

THECLA VIECA, new species.

Diagnosis.—Primaries blackish gray, shaded with lilacine gray at base and on inner margin. Secondaries white, shaded with lilacine blue; the costal and outer margins blackish gray; a terminal darker line; fringe white. Underneath light brown. Primaries, a subterminal broad, darker brown shade from costa to vein 2, outwardly lunular and shaded with white, followed by a straight whitish shade; inner margin whitish. Secondaries, an outer irregular lunular white line; a white linule near base of costa; a broad median white shade from costa to cell posteriorly, and partly extending below vein 2; outer margin broadly whitish, leaving a lunular subterminal light brown line, and similar marginal spots between the veins; a small red spot and black point on subterminal between veins 2 and 3; an anal black spot surmounted with red.

Expanse.—Twenty-seven millimeters.

Habitat.—Cucuta, Venezuela.

Type.—No. 5930, U.S.N.M.

THECLA RICKMANI, new species.

Diagnosis.—*Male*.—Primaries black, shaded along submedian vein with dark metallic blue. Secondaries dark metallic blue; the costa and outer margin narrowly black; a white spot on inner margin near anal angle; fringe terminally white. Underneath light olivaceous brown. Primaries, a fine black outer line outwardly shaded with buff from costa to vein 2; a subterminal dark shade, not reaching apex. Secondaries, a black outer line outwardly bordered with white, straight from vein 7 to 4, inwardly curved below 3 and below 2, upwardly oblique from submedian to inner margin; a black subterminal lunular line, touching outer line at vein 2 and submedian, broadly shaded with red outwardly below vein 3 to inner margin, and slightly to just above

vein 3; the red very broad between veins 2 and 3; a black anal spot surmounted with white.

Expanse.—Thirty millimeters.

Habitat.—Colombia.

Type.—No. 5931, U.S.N.M.

THECLA ZURKVITZI, new species.

Diagnosis.—*Male*.—Wings dark brown; a terminal black line. Secondaries, a marginal white line, and a dark red spot at anal angle. Underneath, light brown; a terminal blackish line. Primaries reddish brown, outwardly black and then white, from costa slightly oblique to vein 2, below vein 2 placed more inwardly; a subterminal dark brown line interrupted by veins. Secondaries, the outer line brighter red, outwardly black and then white, straight between veins 4 and 7, above 7 placed more outwardly; below 4 starting more inwardly to vein 2, below 2 inwardly angled, and outwardly angled on submedian; a black spot surmounted by red at anal angle; subterminal dark brown shaded with white, lunular, broadly followed by red from veins 2 to 3, forming a lunule filled in with black; some red above vein 3.

Expanse.—Twenty-five millimeters.

Habitat.—Sao Paulo, southeast Brazil.

Type.—No. 5932, U.S.N.M.

THECLA EPOPEOIDES, new species.

Diagnosis.—*Female*.—Primaries dull metallic blue on inner margin and basal half, otherwise black. Secondaries dull metallic blue, the margins black; the outer margin only narrowly so. Underneath dark gray. Primaries, a white line from costal margin to vein 2 just beyond cell; a subterminal finer white line, slightly wavy, and curved from costal to inner margin, and outwardly shaded with darker gray. Secondaries, an outer white line nearly straight from vein 8 to vein 4 then inwardly curved to vein 3, and deeply curved outwardly between veins 2 and 3; below vein 2 an inward curve and an outward angle before inner margin; the subterminal line fine, lunular between the veins, outwardly edged with black below vein 3, and followed by an orange spot between veins 2 and 3, containing outwardly a triangular black spot; a few orange and dark scales at anal angle; a terminal dark line inwardly shaded with whitish; some marginal whitish shades between the veins.

Expanse.—Twenty millimeters.

Habitat.—Coatepec, Mexico.

Near *T. epopea* Hewitson.

Type.—No. 5933, U.S.N.M.

THECLA CONOVERIA, new species.

Diagnosis.—*Male.*—Primaries, costal margin very convex at base; black; dark metallic blue scales at base of cell; space below median and vein 2 to near outer margin dark metallic blue; a darker spot at end of cell, but not a brand. Secondaries dark metallic blue; costal and inner margin broadly black; outer margin finely black; some long black hairs below median and vein 2; tails tipped and margined with white; some white hairs on fringe at anal angle. Underneath gray. Primaries an oblique outer white line from costa to vein 2, inwardly shaded with dark gray; a subterminal white line, slightly curved below costa; broken somewhat between the veins, and outwardly shaded with dark gray; a terminal dark line and darker fringe. Secondaries, a white line at a third from base from vein 8 to median at vein 2; and outwardly shaded with darker gray; outer line white nearly straight to vein 3, broken on vein 2, and angled below it, inwardly shaded with dark gray; subterminal line white, outwardly shaded with dark gray, evenly curved to vein 3, interrupted by the veins; a black anal spot; some yellow and brown scales on a whitish space between veins 2 and 3; a dark space irrorated with white below vein 2.

Expanse.—Twenty-four millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 5934, U.S.N.M.

THECLA CURTIRA, new species.

Diagnosis.—*Male.*—Primaries, basal half dark violaceous blue; outer margin and apex black; a large oval black brand at end of cell. Secondaries dark violaceous blue; apex broadly, outer margin narrowly black. Underneath grey. Primaries; a blackish space at base below cell; a fine straight brown line beyond cell from veins 7 to 2, outwardly shaded with whitish; a submarginal fine brownish shade. Secondaries; a fine brownish line, outwardly shaded with white, broken at veins 7, 4, and 2; submarginal triangular brown spots shaded with white; an orange spot containing outwardly a small black spot between veins 2 and 3; a few orange and dark brown scales at anal angle.

Expanse.—Twenty-four millimeters.

Habitat.—Aroa, Venezuela.

Allied to *T. demea* Hewitson and *T. lebena* Hewitson.

Type.—No. 5935, U.S.N.M.

THECLA TELLA, new species.

Diagnosis.—*Female.*—Wings above blackish brown; some blue scales on secondaries below median and vein 2. Underneath, primaries brownish gray; a reddish brown outer band from vein 7 to 2, outwardly shaded with white; two brown spots below vein 2, placed more

inwardly; submarginal brown spots between the veins. Secondaries gray; an irregular brown outer line; large subterminal brown spots between the veins, partly bordered with black scales; a terminal dark line; some black scales at anal angle.

Expanse.—Twenty millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 5936, U.S.N.M.

THECLA CHALUMA, new species.

Diagnosis.—*Female*.—Primaries, basal two-thirds dull violaceous blue, otherwise black. Secondaries dull violaceous blue; outer margin black; a terminal velvety black line, preceded by a dull whitish shade; a single broad long tail. Underneath dull grayish brown. Primaries, a dark shade just beyond cell from costa, somewhat curved inwardly to vein 4, then straight to 2, partly shaded outwardly with white; a broad dark brown subterminal shade to vein 2, a submarginal brown shade interrupted by veins. Secondaries, a broad median dark brown shade, widest in cell, and containing some bluish white scales below vein 5, a narrower outer brown shade outwardly toothed on veins; a broad terminal brown shade irrogated with grayish scales toward anal angle; a black terminal line.

Expanse.—Thirty-one millimeters.

Habitat.—St. Catherina, Brazil.

Type.—No. 5937, U.S.N.M.

THECLA TAMINELLA, new species.

Diagnosis.—Wings above blackish brown; a terminal black line, preceded on secondaries by a fine whitish shade; an orange spot at anal angle. Underneath, base brown, followed by a broad creamy white band, outwardly angled below vein 2, and again followed by a broad brown space, limited by a white outer line which is straight on primaries, angular on secondaries below vein 4, where it is also inwardly shaded with black; outer margin broadly light brown; a subterminal dark brown line preceded by a broad whitish shade; a terminal black line preceded by a white line; an orange spot and some black scales between veins 2 and 3 on secondaries; a black anal spot, geminate and surmounted by orange scales.

Expanse.—Twenty millimeters.

Habitat.—Castro, Parana, Brazil.

Allied to *T. tabena* Godman and Salvin.

Type.—No. 5938, U.S.N.M.

THECLA RANA, new species.

Diagnosis.—Wings dark brown; fringe white outwardly, dark brown at base; a narrow light blue marginal space on secondaries from inner margin to vein 4, containing three dark round spots.

Underneath, dull gray. Primaries, an outer row of five black spots curved below costa, the lower two spots placed more inwardly; a submarginal brown shade, interrupted by the veins, and partly shaded with bronzy red; a terminal black line. Secondaries, a black spot above cell, another within it; discocellular partly finely black; an outer row of black spots, the costal spot largest, the spot between veins 6 and 7 close to cell; the spots all inwardly shaded with reddish brown; a subterminal row of brownish spots followed by orange below vein 4, broadly so on inner margin and between veins 2 and 3, where there is also a black spot; a black anal spot; a terminal black line preceded by a whitish line.

Expanse.—Male, 17 millimeters; female, 20 millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5939, U.S.N.M.

THECLA MUATTINA, new species.

Diagnosis.—Primaries grayish brown, shaded with dull lilacine blue in cell and below it; fringe orange. Secondaries dull lilacine blue; the outer margin and apex grayish brown; a terminal dark line preceded by a whitish shade below vein 7; an orange spot at anal angle; a smaller orange spot between veins 2 and 3; fringe dark gray divided by a pale line. Underneath brownish gray. Primaries, an oblique white outer line from costa to vein 2, then forming a deep angle inwardly below vein 2; above vein 2 this line is inwardly shaded with dark gray; a faint subterminal fine dark line. Secondaries, an irregular fine white outer line, angled twice below vein 3, inwardly shaded with dark gray; a fine whitish subterminal interrupted shade followed by a large red spot at anal angle and between veins 2 and 3, this latter containing outwardly a small black spot; a terminal dark line preceded by a white line.

Expanse.—Twenty-seven millimeters.

Habitat.—Castro, Parana, Brazil.

Differs from *T. muatta* Hewitson in the orange fringe on primaries and orange spot on secondaries.

Type.—No. 5940, U.S.N.M.

THECLA BINANGULA, new species.

Diagnosis.—*Male*.—Primaries truncated at apex, excavated below vein 5. Secondaries prolonged and excavated between anal angle and vein 2. Primaries dark brown; a few scattered blue scales at base; a large darker space at end of cell. Secondaries pale blue; the costa broadly brown, the fringe brown at base, outwardly whitish; inner margin brown with long gray hairs; a black point and line below vein 3. Underneath grayish brown. Primaries, a brownish spot at end of cell inwardly and outwardly shaded with whitish; a broad

brown outer shade outwardly limited by a whitish line; outer margin brown mottled with gray at apex. Secondaries, a round brown spot towards base circled with whitish; a geminate outer whitish line preceded by an angular white mark on costa and on inner margin; outer margin darker, shaded with reddish brown below vein 4.

Expanse.—Nineteen millimeters.

Habitat.—Peru.

Type.—No. 5941, U.S.N.M.

THECLA BOLIMA, new species.

Diagnosis.—*Male*.—Shape similar to *T. binangula* Schaus, but the primaries are somewhat more rounded. Primaries similar to *T. binangula*. Secondaries similar, but with a terminal row of black spots between the veins below vein 7. Underneath brownish gray. Primaries, discal spot and outer shade as in *T. binangula*; a subterminal fine brown line. Secondaries, a large round spot above cell near base; a median costal, a discal, and a spot on inner margin, brown, circled with whitish. An outer row of annular whitish spots filled in with brown, and somewhat coalescing; the outer margin olivaceous brown; a faint reddish brown spot at anal angle, and another between veins 2 and 5. The female has the blue on secondaries more confined to outer margin.

Expanse.—Male, 23 millimeters; female, 27 millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5942, U.S.N.M.

THECLA POLAMA, new species. *

Diagnosis.—*Male*.—Primaries dark violaceous; the outer margin black for a width of 2 millimeters, the brand long divided by a curved violaceous line, the inner portion of brand lighter brown, the outer portion dark brown. Secondaries, dark violaceous, the outer margin black, widely so at apex; a terminal whitish line at anal angle; the fringe reddish brown. Underneath silky brown. Primaries, an irregular black streak from costa to vein 4 broken into spots by the veins just beyond cell; two black spots between veins 2 and 4 placed more outwardly; a curved subterminal brown shade somewhat lunular and slightly shaded inwardly with lilacine. Secondaries, a large black costal spot near base; an outer row of small black spots below vein 7, becoming a fine interrupted black line below vein 4, outwardly shaded with white; the subterminal line, fine, black interrupted by the veins and inwardly shaded with whitish blue especially toward inner margin; a black anal spot; a black spot between veins 2 and 3, the intermediate space irrorated with bluish white spots. Abdomen with a ventral golden line edged with black. Female, dull blue, the margins broadly brown black. Underneath duller than the male.

Expanse.—Male, 35 millimeters; female, 36 millimeters.

Habitat.—Petropolis, Castro, Brazil.

Allied to *T. polibetes* Cramer; differs in color, and spots on primaries below.

Type.—No. 5943, U.S.N.M.

THECLA FOYI, new species.

Diagnosis.—*Male*.—Primaries, black; the greater portion of cell, a line above it and the space below it to near outer margin, brilliant dark blue. Secondaries, brilliant dark blue, outer margin finely black; outer half of costa above vein 6, black; inner margin, grayish; some white scales at anal angle. Underneath, light grayish brown. Primaries, a fine outer line from veins 2 to 7, whitish, inwardly shaded with brown. Secondaries, a fine white outer line interrupted at veins 2, 4, and 7, inwardly shaded with brown, darkest toward inner margin; a faint whitish subterminal shade divided by fine brownish crescents; a small thick red crescent between veins 2 and 3, with a black spot outwardly; a smaller red shade and a black spot at anal angle; a terminal brown line inwardly shaded with white below vein 4. Female wings dark brown. Primaries shot with blue on inner margin near base. Secondaries shot with metallic blue in and below cell to near outer margin. Underneath similar to male.

Expanse.—Male, 27 millimeters; female, 25 millimeters.

Habitat.—Peru.

Type.—No. 5944, U.S.N.M.

THECLA ARITIDES, new species.

Diagnosis.—*Male*.—Primaries, black; base of cell and below it obliquely to near inner angle bright cerulean blue; a brownish quadrate brand at end of cell; fringe reddish. Secondaries, bright cerulean blue; the apex blackish, becoming narrow at vein 3; fringe brown, divided by a white line below vein 4; a subterminal dark broken line below vein 3. Underneath, silky reddish brown. Primaries, a disco-cellular pale-blue streak; a fine pale-blue outer line from costa to submedian vein. Secondaries, lines pale blue; a median line from costa to lower angle of cell; an outer straight line from veins 7 to 4, below it a fine W to inner margin; an interrupted subterminal line; a reddish brown space with a black spot between veins 2 and 3; some reddish brown below vein 2; a dark spot at anal angle surmounted by pale blue scales.

Expanse.—Twenty-four millimeters.

Habitat.—Merida, Venezuela.

There is a specimen of this species in M. Godman's collection labeled *aratus*, by Moritz.

Type.—No. 5945, U.S.N.M.

THECLA ECHINITA, new species.

Diagnosis.—*Female.*—Wings, dull bluish gray. Primaries, apex and outer margin blackish; fringe, buff. Secondaries, a terminal white line preceded by blackish triangular spots; fringe black at base, outwardly white. Underneath, gray. Primaries, a reddish brown outer curved band outwardly shaded with white, fine and inwardly angled below vein 2; a subterminal dull brownish shade interrupted by the veins; the costa finely, and base of fringe reddish brown. Secondaries, an irregular outer brown band, outwardly shaded with white; the subterminal dull brown, lunular, outwardly shaded with reddish brown below vein 6, more thickly so between veins 2 and 3 and there followed by a black point; a black streak at anal angle; a fine terminal brown line; fringe, white.

Expanse.—Twenty-four millimeters.

Habitat.—Orizaba, Mexico.

Type.—No. 5946, U.S.N.M.

THECLA GUADALA, new species.

Diagnosis.—*Male.*—Primaries, metallic steel blue; the apex broadly black; a somewhat oval black brand at the end of cell; fringe, light brown. Secondaries, metallic steel blue, the costa narrowly black; the outer margin finely black; fringe, grayish; a white line and a red spot at anal angle. Underneath, dark gray. Primaries, a white outer line inwardly shaded with dark gray, very indistinct and inwardly angled below vein 2; a darker gray subterminal line interrupted by the veins. Secondaries, the outer line as on primaries, nearly straight, curved near inner margin and broken at vein 2; the subterminal darker gray, inwardly shaded with bluish white, interrupted by a round red spot below vein 3, this spot inwardly limited by a black crescent, outwardly by a black point; anal angle red, with two black spots and some bluish white irrorations; a terminal dark brown line preceded by white below vein 4.

Female.—Primaries black, the basal third bluish gray. Secondaries, bluish gray; the outer margin narrowly, the costal margin broadly black; a terminal black line preceded by white below vein 4; a black marginal spot between veins 3 and 4; a red spot at anal angle. Underneath, similar to the male.

Expanse.—Male, 30 millimeters; female, 28 millimeters.

Habitat.—Guadalajara, Mexico.

Allied to *T. brescia* Hewitson.

Type.—No. 5947, U.S.N.M.

THECLA TIGONIA, new species.

Diagnosis.—*Male.*—Primaries, brownish black; a large deep black spot at end of cell; a pale-blue streak below cell, and a broader blue space on inner margin, divided by the submedian vein. Secondaries, brown-black irrorated with pale blue in cell, and below it to outer margin; also marginal blue spots between veins 5 and 7; subterminal black spots on the blue from anal angle to vein 6, followed between veins 2 and 3 by a large red spot. Underneath, brownish gray. Primaries, an outer line of contiguous red spots outwardly shaded with black and then with white from costa to vein 2; a subterminal dull-brownish shade slightly mottled with white. Secondaries, a red spot above cell, and another within it at a third from base, both shaded inwardly with white; an irregular outer row of red spots, outwardly shaded with black and white as on the primaries; subterminal lunular white shades; a red spot between veins 2 and 3, and another at anal angle, both followed by a black spot; a terminal brown line preceded by a white line. Female, wings dark brown. Secondaries, a small red spot at anal angle; a large red spot containing a black spot outwardly between veins 2 and 3; some small bluish white marginal spots. Underneath, like the male; the red spot in cell of secondaries smaller.

Expanse.—Male, 30 millimeters; female, 32 millimeters.

Habitat.—Peru.

Allied to *T. ziba* Hewitson.

Type.—No. 5948, U.S.N.M.

THECLA ILLEX, new species.

Diagnosis.—*Male.*—A large black band at end of cell, followed by a brown band beyond cell. Primaries, metallic blue; from middle of costal margin to inner margin near angle the apical portion is black. Secondaries, metallic blue; the costal margin broadly black; the outer margin narrowly black; the inner margin grayish; a red spot at anal angle; tip of tail white. Underneath, brown. Primaries, a faint subterminal darker line; a fine outer line, blue-white, slightly curved outwardly between veins 4 and 6, and not extending below vein 3. Secondaries, a median blue-white line somewhat curved inwardly on costal margin, then obliquely curved to vein 6 and irregular between the veins to inner margin close above the subterminal shade, which is blackish brown, inwardly shaded with white and interrupted by the veins, and including a red spot at anal angle, and between veins 2 and 3; anal angle, black; fringe, blackish, preceded by a whitish crescent between veins 2 and 3.

Expanse.—Thirty-three millimeters.

Habitat.—Colombia.

Type.—No. 5949, U.S.N.M.

THECLA HOSTIS, new species.

Diagnosis.—*Male.*—Primaries, a brown brand at end of cell; a gray brand beyond it, separated and encircled by blue; the costa above cell and brands, the apex and outer margin black, otherwise dark metallic blue. Secondaries dark metallic blue; the costal margin black; the outer margin finely black; the fringe black, terminally white. Underneath brownish gray. Primaries, a curved whitish outer line, inwardly edged with darker gray from veins 7 to 2; faint subterminal darker shades between the veins. Secondaries, an outer line, slightly irregular, cut by the veins, white, inwardly edged with dark gray; subterminal dark-gray crescents between the veins, shaded with white and interrupted between veins 2 and 3 by a large red spot containing a black point outwardly; a terminal white line below vein 5; fringe dark brown at base, terminally white; a black spot at anal angle.

Expanse.—Twenty-eight millimeters.

Habitat.—Nova Friburgo, Brazil.

Allied to *T. tephreus* Hübner.

Type.—No. 5950, U.S.N.M.

THECLA GENTILLA, new species.

Diagnosis.—*Male.*—Wings dark bluish gray, without any metallic shading; the outer margins finely blackish. Underneath, light grayish brown; whitish discocellular streaks. Primaries, a fine darker outer line, straight from costa to vein 2, outwardly shaded with whitish. Secondaries, a terminal black line inwardly shaded with white below 3; the outer line blackish, outwardly shaded with white, inwardly oblique from costa to vein 7, then straight to vein 4, inwardly curved below 3, and below vein 2, angled before inner margin; the two lunules filled in with black, which is irrorated with red in the lunule below vein 2, and is also followed by a black space thickly irrorated with white; the lunule below vein 3 is followed by a large black spot containing a red lunule; some black and white at anal angle.

Expanse.—Twenty millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 5951, U.S.N.M.

THECLA GUZANTA, new species.

Diagnosis.—*Male.*—No brands; wings darkish brown; fringe still darker at base, terminally grayer. Secondaries, a red spot at anal angle; also some long white hairs. Underneath lighter brown; a pale discocellular streak. Primaries, a dark outer line shaded inwardly with red, outwardly with white, straight from costa to vein 4, then bent in slightly and straight to vein 2; a fine dark subterminal line. Secondaries, the outer line much more heavily shaded with red, nearly

straight to vein 4, broken, starting from the red shade on vein 4, oblique to vein 2, then forming a wide W to inner margin; the subterminal black, somewhat lunular, outwardly shaded with red, which thickens between veins 2 and 3, and at anal angle, in both places followed by a black spot. There is a dark marginal space below vein 2 irrorated with white. The female is similar; the red on Secondaries below not quite so bright.

Expanse.—Twenty-two millimeters.

Habitat.—Jalapa, Orizaba, Mexico.

Type.—No. 5952, U.S.N.M.

THECLA FOSTERA, new species.

Diagnosis.—*Female*.—Primaries, brown, thinly irrorated with light blue on basal half of inner margin; extreme costa orange on basal third; fringe gray, whitish at inner angle. Secondaries, light blue; the costal margin broadly brown; three red marginal spots between vein 3 and inner margin; black marginal points above vein 3 on blue portion; a terminal dark line; fringe grayish. Underneath, light gray; a terminal red line, and fine red discocellular streak. Primaries, an outer line of red spots from costa to vein 2, the spot between veins 3 and 4 placed more inwardly; a fine dark gray subterminal line. Secondaries, a red spot in cell and one above it; an outer row of large red spots, forming a broken W at inner margin; a large red spot at anal angle; another with a black point between 2 and 3, and a smaller spot above vein 3; a darker gray broken subterminal line; an orange spot on head; abdomen banded with pale blue.

Expanse.—Twenty-nine millimeters.

Habitat.—Sao Paulo, southeast Brazil.

Type.—No. 5953, U.S.N.M.

THECLA FARMINA, new species.

Diagnosis.—*Female*.—Primaries, metallic blue, the costa, apex, and outer margin black. Secondaries, metallic blue, the fringe long, black, divided by a pale line. Underneath, dark gray; a terminal dark line inwardly shaded with white; a broad subterminal whitish and brown shade. Primaries, an outer dark red line outwardly shaded with black and then white from costa to submedium vein. Secondaries, a medium dark red line broken into spots, outwardly edged with black and then with white; the spot from 4 to 6 placed more outwardly; below it, from nearer cell, the line curved and angled before inner margin. A dark-red spot at anal angle and on margin between veins 2 and 3, both followed by a black spot.

Expanse.—Sixteen millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5954, U.S.N.M.

THECLA LANCKENA, new species.

Diagnosis.—Wings, above, blackish gray. Secondaries, a reddish spot at anal angle; a terminal black line preceded by a white line below vein 3. Underneath light brown, base of fringe darker. Primaries, costal edge finely orange at base; a black outer line from costa to vein 2, divided by a dark-red line; a fine subterminal brown shade curved below apex. Secondaries, a broad bright red outer band, widening outwardly, on costa and between veins 4 and 6, angled near inner margin, outwardly shaded with black and then with white; a subterminal brownish shade; some marginal red scales above and below vein 3, and also above and below the submedian; a large black spot at anal angle, a smaller one between veins 2 and 3.

Expanse.—Twenty-eight millimeters.

Habitat.—Peru.

Allied to *T. bagrada* Hewitson.

Type.—No. 5955, U.S.N.M.

THECLA CHILICA, new species.

Diagnosis.—*Male*.—Primaries blackish; the cell, and below it obliquely to near inner angle metallic blue; a large round black band beyond the cell. Secondaries, metallic blue; the costal and inner margins grayish; a marginal white line at anal angle. Underneath whitish. Primaries, a dark discocellular streak; a wavy oblique brown outer line from costa to submedian; a subterminal lunular brown line from costa to vein 2. Secondaries, a fine discocellular streak; a reddish brown median line almost broken into spots and forming a W before inner margin, outwardly shaded with black; the subterminal, as on primaries, followed by an ochreous and black spot between veins 2 and 3; some marginal faint brownish shadings, and a terminal fine brown line on both wings.

Expanse.—Nineteen millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5956, U.S.N.M.

THECLA HUMBER, new species.

Diagnosis.—*Female*.—Wings metallic blue. Primaries, costa above cell and vein 4, also outer margin, black. Secondaries, costal margin and apex black; outer margin otherwise narrowly black; a small red spot and black point at anal angle. Underneath light brownish gray. Primaries, an oblique white outer line, finely wavy, from below costa to vein 2; a whitish subterminal shade; a whitish marginal shade. Secondaries, the subterminal and marginal shades as on primaries, the former interrupted by a red and orange spot, between veins 2 and 3,

containing a black point; an outer white line inwardly shaded with dark gray, straight from costa to vein 4, then irregular, forming a W to inner margin; a small red spot at anal angle.

Expanse.—Twenty-three millimeters.

Habitat.—Cucuta, Venezuela.

Allied to *T. keila* Hewitson.

Type.—No. 5957, U.S.N.M.

Family PAPILIONIDÆ.

PIERINÆ.

LEODONTA MARGINATA, new species.

Diagnosis.—Primaries white; the outer half of costa, the apical portion and outer margin broadly black, the black extending into the cell; some black at base; an outer oblique row of five small white spots from costa to above vein 2; two small subapical white spots. Secondaries white; the outer margin broadly black; a yellow shade and two yellow spots in cell; a row of elongated yellow spots in interspaces surrounding cell; white spots on extreme outer margin. Underneath, primaries similar; the white spots larger and tinged with yellow on costa; outer margin above vein 4 light brown, streaked with black between the veins; a yellowish white spot on costa at apex cut by vein 8. Secondaries light brown; the veins black; a crimson streak on costa at base; a crimson spot above cell at base; a yellow spot in upper part of middle of cell; a white spot shaded with yellow at lower angle of cell; some blackish scales between the two spots in cell; a medium row of large white spots each containing a yellow streak; the costal spot reaching the crimson basal spot; these spots limited by a dentate dark-brown line spotted with black on the outer angles; broad, terminal streaks between the veins, black, irrorated with yellow, forming also a subterminal point on each streak; some white at apex and on margin between veins 5 and 6.

Expanse.—Fifty-two millimeters.

Habitat.—Merida, Venezuela.

A specimen is also in the British Museum.

Type.—No. 5958, U.S.N.M.

PIERIS SUBLINEATA, new species.

Diagnosis.—Primaries white; a small black spot on discocellular; the apex broadly black; a marginal triangular black spot at vein 4; a smaller one at vein 3, and a black point at vein 2. Secondaries white; the tips of veins finely black; fringe black at anal angle. Underneath, primaries white; the discal spot black, larger, preceded by a black dash; the apex broadly dark brown; tips of veins 2, 3, and 4 shaded with dark brown. Secondaries yellow; veins black; a terminal

brown line; costa finely brown; an orange streak at base; an orange spot at base of wing; a dark brown streak from base along vein 7 to apex; an interrupted curved outer brown shade, forming indistinct spots.

Expanse.—Seventy-six millimeters.

Habitat.—Peru.

A specimen is also in the British Museum.

Type.—No. 5959, U.S.N.M.

PAPILIONINÆ.

PAPILIO SOCAMA, new species.

Diagnosis.—*Male*.—Body black; lateral red spots on thorax, and abdomen below; also a red line on last segment of abdomen below. Primaries black; fringe partly white between the veins. Secondaries crenulate, black, the inner margin with fold containing buff hairs; fringe white between the veins; a subterminal row of six small red spots between the veins. Underneath the same, the red spot at anal angle close to margin.

Expanse.—Eighty-two millimeters.

Habitat.—Bolivia.

Type.—No. 5960, U.S.N.M.

Family HESPERIIDÆ.

JEMADIA PAULENSIS, new species.

Diagnosis.—Head black, spotted with pale blue. Collar black, spotted with white; thorax black; two inner blue streaks; two whitish outer streaks. Abdomen black, banded with white interrupted subdorsally. Primaries black, tinged with purple; some blue spots at base; a broad median hyaline white band from subcostal to near submedian, tapering at either end; below it a pale-blue streak above and another below the submedian; an oblique subapical hyaline line from costa to vein 5, divided into four spots; a subterminal interrupted line not reaching apex. Secondaries violaceous black; the inner margin shaded with blue and preceded by a whitish streak; a shorter broader white streak across base of cell; a broad subterminal blue band widest on costa, fringe white, spotted with black at ends of veins. Underneath, primaries with a white costal streak above median band; some blue scales at end of cell; lower portion of hyaline spot opaque, white; subterminal as above. Secondaries a blue streak on inner margin; a transverse basal and an inner blue streak; a median blue streak not reaching costa, or inner margin; the subterminal band as above.

Expanse.—Sixty-three millimeters.

Habitat.—Sao Paulo, Brazil.

Type.—No. 5961, U.S.N.M.

JEMADIA BREVIPENNIS, new species.

Diagnosis.—Head and collar black; a pale point at base of antennæ. Thorax black, streaked with green. Abdomen black, banded with greenish white, interrupted subdorsally. Primaries black; some green scales and white hairs at base; an inner transverse green line below subcostal; a broad median hyaline white band cut by median and vein 2; below this a green streak above and another below the submedian; a large hyaline white outer spot from veins 3 to 5, cut by vein 4; a broad subapical hyaline spot above vein 4, cut by veins into four parts; a subterminal green shade from submedian to vein 5. Secondaries black; some white hairs at base; a greenish streak on inner margin and another close to it; a transverse green spot at end of cell; a broad subterminal green shade not reaching costa, interrupted by the veins and tapering toward anal angle. Underneath, primaries black, the spots and subterminal line as above; some greenish streaks at base; some green scales above outer spot; a green streak on outer half of inner margin. Secondaries black, with green markings; a streak on inner margin; a basal and an inner transverse streak; a median streak across end of cell not reaching costal or inner margins; a broad subterminal band, widest on costa. Fringe brown, at anal angle fringe white, spotted with brown. The secondaries are unusually short.

Expanse.—Fifty-five millimeters.

Habitat.—Sao Paulo, Brazil.

Type.—No. 5962, U.S.N.M.

EUDAMUS CALLICINA, new species.

Diagnosis.—*Female*.—Wings brown; some olivaceous yellow hairs at base and along the inner margin of secondaries. Primaries, spots whitish, semihyaline; a spot in cell, one between 2 and 3, and a smaller one below vein 2; these three spots outwardly concave; a smaller spot between 3 and 4; a small oblique outer streak above vein 4; three small spots below costa before apex; fringe brown. Secondaries with faint traces of an inner and an outer darker line; fringe white; tails rather long. Underneath, primaries brown, the inner margin paler; a whitish streak from discal spot to costal margin. Secondaries brown, tinged with violaceous; a darker curved inner line broken into spots; the outer band curved, not extending below vein 2.

Expanse.—Forty-six millimeters.

Habitat.—Honduras.

Closely allied to *E. callias* Mabille.

Type.—No. 5963, U.S.N.M.

EUDAMUS JANITA, new species.

Diagnosis.—Wings brown; fringe fawn-color, spotted with brown. Primaries, spots semihyaline whitish; a median costal streak; a large spot in cell, and one between veins 2 and 3, both contracted in their middle; a very small spot below vein 2; a spot between veins 3 and 4 placed more outwardly; a very oblique row of four small spots below costa before apex. Secondaries with olivaceous brown hairs. Underneath, primaries brown, the inner margin paler; the space beyond discal spot to apex thickly irrorated with gray. Secondaries, lilacine gray, striated with brown; a brown spot above cell near base; a broad median brown band and a narrower brown wavy outer band.

Expanse.—Thirty-eight millimeters.

Habitat.—Rio Janeiro, Brazil.

Type.—No. 5964, U.S.N.M.

EUDAMUS PITHYS, new species.

Diagnosis.—Wings dark brown; fringe buff, spotted with black. Primaries, some buff scales at base of costa; spots semihyaline, yellowish white; an oblique row from middle of costa toward inner angle; a spot above and one below subcostal vein; a quadrate spot outwardly concave below vein 3; a smaller, posteriorly round spot just below vein 2; more outwardly a large spot from 3 to 4, above which a small spot between 4 and 5, and a fine linear spot between 5 and 6; a quadrate larger spot from 6 to 7, and three elongated spots above 7, more inwardly. Secondaries, tails long, blackish. Underneath, primaries lighter brown; the spots as above surrounded by blackish shades; a lilacine brown space beyond cell between 3 and 7; outer margin darker; subterminal lilacine brown lunular spots, paler on costa near apex. Secondaries, lilacine brown, markings blackish brown, finely edged with a paler lilacine brown shade; an irregular basal band; a median irregular band; an irregular outer band from vein 7 to submedian, broken into spots between 3 and 6, followed by a small buff space between 3 and 4, and a paler broader lilacine space below vein 2; marginal dark shade, becoming broader below vein 3; tail entirely blackish brown.

Expanse.—Forty-five millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5965, U.S.N.M.

THYMELE SUBVIRESCENS, new species.

Diagnosis.—Palpi red; the third joint black. Head red; some black around the eyes. Collar and abdomen blue black, the anus and last three segments below red. Wings blue black. Primaries, fringe

brown above vein 3, whitish below vein 3. Secondaries, fringe yellow. Underneath olivaceous with black veins. Primaries, lower part of cell and inner margin to vein 3 blue black. Secondaries, a broad blue black space from base to anal angle, not extending below the submedian.

Expanse.—Forty-three millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5966, U.S.N.M.

THYMELE GRENADENSIS, new species.

Diagnosis.—Wings brown, with darker transverse bands. Primaries, a median and an outer band, the latter incurved below end of cell. Secondaries, some lighter brown hairs; the median band visible on costa only; the outer band distinct. Underneath similar; the secondaries with the median band distinct; also some yellowish irroration at base between the bands, near the inner margin, and along the outer margin.

Expanse.—Forty-four millimeters.

Habitat.—Grenada, British West Indies.

Type.—No. 5967, U.S.N.M.

TELEGONUS JANEIRA, new species.

Diagnosis.—Body dull blue green. Primaries blue black, shaded with green at base and along inner margin. An oblique row of white hyaline spots from middle of costa; the costal spot very small; a large quadrate spot in cell; a larger spot between veins 2 and 3, surmounted by a small spot between 3 and 4 close to cell; a spot below vein 2, close to outer margin. Secondaries blue green; the costal margin broadly black; the outer margin narrowly black. Underneath, primaries blackish; a subterminal gray band; the spot below vein 2 shaded with white below and on either side. Secondaries blackish brown, irrorated thinly with yellow scales, forming a median spot below vein 2; the outer margin broadly grayish except at apex.

Expanse.—Forty-nine millimeters.

Habitat.—Rio Janeiro, Brazil.

Type.—No. 5968, U.S.N.M.

TELEGONUS HURGA, new species.

Diagnosis.—Head, collar, and thorax green; abdomen brown, shaded with green at base. Palpi brighter green with yellow hairs at base. Wings brown, shaded with green at base; a faint outer darker shade on secondaries. Underneath somewhat lighter brown; the base of

costal margins bright metallic blue green; the inner margin of primaries yellowish white; on secondaries a darker outer shade, outwardly edged with yellowish.

Expanse.—Forty-one millimeters.

Habitat.—Peru.

Type.—No. 5969, U.S.N.M.

NASCUS ORIMA, new species.

Diagnosis.—Wings brown. Primaries with semitransparent spots; three small spots below costa before apex, yellowish; a large quadrate yellowish spot in cell from subcostal to median at vein 3; a larger spot below it between veins 2 and 3 and a small one between 3 and 4, inclosing a minute triangular brown space; a spot below vein 2; the last three spots more ochreous. Secondaries with light olivaceous brown hairs, except on costal and outer margins; a darker median and outer line. Underneath duller brown. Primaries, a yellowish spot on costa surmounting the diskal spot; secondaries with a small geminate yellowish spot below vein 2, outwardly on outer dark band.

Expanse.—Forty-one millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 5970, U.S.N.M.

NASCUS ORITA, new species.

Diagnosis.—Wings dark brown, with paler olivaceous brown hairs at base. Primaries, a median yellowish spot on costa, followed by an oblique white semitransparent band to below vein 2 toward inner angle, cut by veins into four parts and inclosing a small brown spot at cell above vein 2; three small subapical white spots from costa. Secondaries produced into a short, blunt, curved tail, above which the fringe is white spotted with dark brown at veins 2, 3, and 4. Primaries below with the median costal spot white; the apex thinly irrorated with whitish scales. Secondaries below, an indistinct darker inner and outer shade; an irregular subterminal white spot below vein 2.

Expanse.—Thirty-eight millimeters.

Habitat.—Peru.

Type.—No. 5971, U.S.N.M.

TELEMIADES MEGALLOIDES, new species.

Diagnosis.—*Male*.—Wings dark brown, thinly irrorated with ochreous hairs; a median and an outer darker wavy shade. Primaries, some small transparent spots; two at end of cell; a geminate spot between veins 2 and 3; one above vein 3 placed more outwardly; three subapical spots, the middle one farthest from apex. Underneath similar, somewhat paler, and the lines broken into spots.

Female.—Lighter brown, the lines forming more distinct spots. Underneath, the basal half of secondaries grayish yellow.

Expanse.—Males, 34 millimeters; females, 39 millimeters.

Habitat.—Peru.

Allied to *T. megallus* Mabille.

Type.—No. 5972, U.S.N.M.

CECROPTERUS OCHRILINEA, new species.

Diagnosis.—Wings dark brown, the fringe grayish. Primaries, a broad dark yellow oblique band from middle of costa to submedian near inner angle; a narrow oblique line of four small whitish spots from costa before apex. Underneath, primaries lighter brown; the apex dark reddish brown to vein 5, below which the outer margin is tinged with lilacine; a grayish streak on costa beyond median yellow band. Secondaries, the costal margin light brown; a large round dark brown basal spot limited by a steel gray line; the median space between veins 7 and 8 steel gray, containing a small brown spot toward base, the median space otherwise to near inner margin reddish brown limited by a black outer line above vein 2, and which is mottled with steel gray above vein 5; below vein 2 the reddish brown extends toward anal angle, and is interrupted by a grayish triangular space on inner margin; apex dark brown; outer margin between veins 2 and 5 tinged with lilacine; fringe at anal angle black.

Expanse.—Thirty-two millimeters.

Habitat.—Peru.

Allied to *C. evelinda* Butler.

Type.—No. 5973, U.S.N.M.

GRAIUS CHORICUS, new species.

Diagnosis.—*Female*.—Wings dark brown, somewhat tinged with violaceous; the outer margin darker; median and outer darker shades somewhat macular. Primaries, three hyaline white points below costa before apex. Underneath duller; the anal half of secondaries thickly irrorated with lilacine scales, on which the outer row of darker brown spots are conspicuous.

Expanse.—Forty-six millimeters.

Habitat.—Paso de San Juan, Mexico.

Type.—No. 5974, U.S.N.M.

LIGNYOSTOLA CYDANA, new species.

Diagnosis.—Wings dark brown. Primaries, the basal third fulvous. Secondaries thickly covered with light ochreous brown hairs except at apex, and on costal margin. Underneath lighter brown; the base of wings and inner margin of secondaries tinged with greenish yellow.

Expanse.—Forty-six millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 5975, U.S.N.M.

PELLICIA BIPUNCTA, new species.

Diagnosis.—Wings dark brown, with still darker shadings. Primaries, inner, median and outer shades suffusing except on costa; the outer shade containing two minute hyaline white spots below costa; a marginal dentate darker line broken by the veins. Secondaries, the shades narrower and not suffusing; the inner shade absent; the marginal line as on primaries. Underneath, lighter brown. Primaries, the inner margin still paler; some ochreous brown at apex; an outer and a marginal darker line. Secondaries, the median line partly geminate; the outer and marginal line wavy.

Epanse.—Twenty-nine millimeters.

Habitat.—Petropolis, Nova Friburgo, Brazil.

Allied to *P. macareus* Herrich-Schaeffer; the lines are not so wavy, and there are only two hyaline costal spots.

Type.—No. 5976, U.S.N.M.

PELLICIA VECINA, new species.

Diagnosis.—Primaries, dark grayish brown, the marking dark brown; an inner band; a median shade to vein 2, outwardly angled; an outer shade angled beyond cell; a marginal shade. Secondaries, dark brown; the costal and inner margins paler. Underneath, primaries, dark brown, the inner margin pale. Secondaries, the costal half of wing dark brown; the anal half whitish gray; traces of darker median, outer and marginal lines. The upper surface is very similar to *P. costimacula* Herrich-Schaeffer, but the secondaries below are quite distinct.

Epanse.—Thirty-two millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 5977, U.S.N.M.

PELLICIA CAPITANS, new species.

Diagnosis.—Head and collar brilliant metallic green, as in *Gorgopas viridiceps* Butler and Druce. Wings, basal half dark velvety brown; outer half light brown, with a dark marginal shade. Primaries, an oblique outer shade below costa, containing three hyaline white points. Secondaries, a narrow, dark, outer shade. Underneath, light brown with traces of darker lines.

Epanse.—Twenty-seven millimeters.

Habitat.—Aroa, Venezuela.

Type.—No. 5978, U.S.N.M.

CYCLOSEMIA TRIGONILLA, new species.

Diagnosis.—Wings light brown, the veins darker; a terminal dark line. Primaries, the ocellus at end of cell black, containing a white point and circled with buff; an outer dark-brown line cut by the veins,

oblique from costa and angled between veins 5 and 6; marginal dark spots between the veins. Secondaries, an outer dark line; dark triangular marginal spots, darkest towards anal angle, which the spots do not reach. Underneath, similar but paler.

Expanse.—Thirty millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 5979, U.S.N.M.

EUDAMIDAS OBSCURIOR, new species.

Diagnosis.—*Male*.—Darker and browner than *E. melander* Cramer. Primaries without the median spot in cell; the subterminal shade is darker and not dentate as in *E. melander*. The same remark applies to the secondaries.

Expanse.—Forty-four millimeters.

Habitat.—Peru.

Type.—No. 5980, U.S.N.M.

GORGYTHION BEGGOIDES, new species.

Diagnosis.—Primaries grayish brown, the markings blackish brown; a basal, and a fine inner line not so dark; a median row of spots suffusing below cell with the outer row, which consists of large elongated spots between the veins, smaller and forming a curve just below costa; a marginal row of spots suffusing towards apex; no hyaline spots. Secondaries light-brown, almost entirely occupied by the darker markings; a narrow basal shade; the median shade suffusing with outer shade below cell; the outer shade broad, irregular; larger marginal spots inwardly rounded. Underneath, primaries dark brown; some white shades on costa and at inner angle. Secondaries, dark brown; the inner margin and anal space broadly white; a white spot in cell; a white streak at end of cell; marginal and subterminal white mottlings.

Expanse.—Fifteen millimeters.

Habitat.—Trinidad, British West Indies.

Type.—No. 5981, U.S.N.M.

GORGYTHION MARGINATA, new species.

Diagnosis.—Similar to *G. pyralina* Hopffer, except that the secondaries have the outer margin broadly blackish brown.

Expanse.—Twenty-eight millimeters.

Habitat.—Peru.

Described from two specimens.

Type.—No. 5982, U.S.N.M.

ANISOCHOSIA SUBPICTA, new species.

Diagnosis.—Wings dark brown. Primaries, the outer margin darker; some paler subterminal spots toward apex; three hyaline white outer spots below costa. Underneath, primaries dark brown; a

large buff space at apex and at inner angle, the former with some dark-gray spots; outer margin from veins 2 to 5 tinged with olivaceous; the fringe olivaceous, spotted with dark brown. Secondaries mottled buff and olivaceous irrorated with dark striae; a pale median line terminating in cell in a silvery spot; a black spot just below origin of vein 2.

Expanse.—Thirty-three millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5983, U.S.N.M.

STAPHYLUS SCORAMUS, new species.

Diagnosis.—Shape of *S. ascalaphus* Staudinger. Wings of a brighter shade without any darker markings; a few yellow irrorations; a subterminal row of small indistinct greenish yellow spots; a similar median shade and inner line. Primaries, two minute hyaline spots below costa before apex. Underneath similar, but duller, the subterminal spots larger and more distinct on secondaries; a paler spot in cell, and another at end of cell. Palpi dark gray.

Expanse.—Twenty-six millimeters.

Habitat.—Peru.

Described from six specimens.

Type.—No. 5984, U.S.N.M.

STAPHYLUS ANGINUS, new species.

Diagnosis.—Shape and markings similar to *S. ascalaphus* Staudinger. Underneath dark brown; the anal half of secondaries thickly irrorated with gray, and a white streak at end of cell.

Expanse.—Twenty-one millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 5985, U.S.N.M.

STAPHYLUS MINOR, new species.

Diagnosis.—Shape of *S. ascalaphus* Staudinger. Wings dull brown, thinly irrorated with yellowish gray scales; no hyaline spots. Inner, median, and subterminal indistinct grayish lines, cut by the veins into spots. Underneath lighter brown, irrorated with yellowish gray scales on costal margin and apex of primaries, and at base, on inner margin and anal angle of secondaries.

Expanse.—Nineteen millimeters.

Habitat.—Peru.

Type.—No. 5986, U.S.N.M.

STAPHYLUS TADUS, new species.

Diagnosis.—Secondaries more evenly crenulate than in *S. ascalaphus* Staudinger. No hyaline spots; wings dark brown, thinly irrorated with pale yellow scales; small median and subterminal grayish spots,

very indistinct. Underneath similar, but duller; a grayish discocellular streak on secondaries; the spots more distinct than on upper surface.

Expanse.—Twenty-six millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 5987, U.S.N.M.

STAPHYLUS TERRENS, new species.

Diagnosis.—Wings dark grayish brown with darker brown markings. Primaries, a basal shade; a broad median space from median vein to inner margin surmounted by a spot in cell, and outwardly suffusing with a broad outer band, somewhat oblique and curved below costa; a fine subterminal line; large marginal spots suffusing towards apex. Secondaries, a spot in cell; a broad outer band; large marginal spots. Underneath, dark brown. Primaries, a faint grayish subterminal shade. Secondaries, inner margin and anal half of wing grayish, crossed by a subterminal brown shade; a gray discocellular streak.

Expanse.—Twenty-nine millimeters.

Habitat.—Venezuela.

Type.—No. 5988, U.S.N.M.

STAPHYLUS ALICUS, new species.

Diagnosis.—Wings dark brownish gray, the markings blackish brown. Primaries, a broad median and outer transverse band, a basal space, and small marginal spots all dark. Secondaries similar; the basal space suffusing with the median band. Underneath, primaries dark brown; the inner margin paler; the outer margin tinged with violaceous. Secondaries violaceous brown, with darker brown markings as on upper surface.

Expanse.—Twenty-four millimeters.

Habitat.—Southeast Brazil.

The margin of wings rounded.

Type.—No. 5989, U.S.N.M.

STAPHYLUS SUBAPICATUS, new species.

Diagnosis.—Head and palpi mottled brown and yellow hairs. Wings dark brown, irrorated at base with light brown hairs, the markings still darker; the median shade somewhat oblique from costa toward inner space; the outer shade slightly curved below costa consisting of elongated spots; similar marginal spots. Secondaries, a dark spot in cell; median and outer shades narrower, suffused below costa; the marginal spots more irregular. Underneath, primaries

dark brown, costa, outer margin below vein 4, and a subapical space grayish; this space evenly curved before apex, leaving the apex dark brown. Secondaries as above, slightly paler.

Expanse.—Thirty-six millimeters.

Habitat.—Songolica, Mexico.

Type.—No. 5990, U.S.N.M.

HELIOPETES PURGIA, new species.

Diagnosis.—Wings white. Primaries, apical portion from just beyond middle of costal margin obliquely to cell, beyond cell, and irregularly to inner angle black; a subterminal row of white spots, oblique from costa to vein 5, then parallel to outer margin; a marginal row of smaller white spots; an outer white spot between veins 3 and 4; fringe dark gray. Secondaries, veins partly black; a terminal black line; marginal black lunules; a subterminal black line, irregular, and interrupted between veins 4 and 6. Base of wings and inner margin of secondaries irrorated with black. Fringe white spotted with black. Underneath, primaries white, the markings pale grayish buff; a black discocellular streak. Secondaries yellowish white; the veins dark gray; the markings pale grayish buff; the subterminal darker and broader than above; a median transverse dark gray band, irregular and nearer base in cell; inner margin broadly whitish without markings.

Expanse.—Thirty millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5991, U.S.N.M.

HELIOPETES SUBLINEA, new species.

Diagnosis.—Wings white, irrorated with black at base; outer margin narrowly black; marginal white spots; fringe white, spotted, with black; a subterminal dark-gray shade partly suffusing with marginal black borders. Primaries, a black discocellular line; a black costal spot above end of cell; veins beyond cell from 4 to costa black; some subapical white spots. Underneath white. Primaries, markings dark gray; a large costal spot at apex; marginal and subterminal lunular lines below vein 4; discocellular and spot above as on upper surface; veins 4 to 6, black for half their length. Secondaries, outer margin broadly olivaceous gray; a dark spot at apex, and darker marginal shade below vein 4; a broad transverse inner band, olivaceous gray, from costa to below vein 2.

Expanse.—Thirty-three millimeters.

Habitat.—Orizaba, Paso de San Juan, Mexico.

Type.—No. 5992, U.S.N.M.

CHIOMARA MARTHONA, new species.

Diagnosis.—Body, brown; base of abdomen and palpi below, grayish. Primaries, base light brown, followed by a lilacine shade, next to which is a velvety black spot below cell; a dark-velvety brown irregular median band, shaded on either side with brown, darker than basal color, and irrorated with lilacine scales; an outer lilacine gray band edged with dark-velvety brown, curved beyond cell and joining median shade on inner margin; the brown edging forming spots most conspicuous below costa, on inner side of outer band; the space between median and outer bands light brown above vein 2; outer margin brown; a dark brown subterminal shade preceded by a paler shade; a terminal darker line. Secondaries, dark brown; a darker subterminal broad shade. Underneath, brown, the outer margins paler; some white on costa at apex of primaries; a terminal dark line; a silvery line on base of fringe.

Expanse.—Thirty-four millimeters.

Habitat.—Peru.

Type.—No. 5993, U.S.N.M.

THANAOS AUSTERUS, new species.

Diagnosis.—Wings dark brown. Primaries, markings formed by dark-grayish irrorations not very pronounced; a few scales forming a median line; a cluster at end of cell, followed by the outer band, which is curved around the cell; the outer margin broadly dark grayish, interrupted by a subterminal dark line; a terminal brown line; base of fringe, gray; the grayish markings more or less limited by five brown lines darker than ground color. Secondaries, dark brown, the outer margin paler, interrupted by a dark-brown subterminal line and a terminal line. Underneath, lighter brown. Primaries, an interrupted outer row of buff spots; some clusters of grayish scales along outer margin; base of fringe, buff. Secondaries, as above.

Expanse.—Thirty-six millimeters.

Habitat.—Peru.

Type.—No. 5994, U.S.N.M.

BUTLERIA ARPIA, new species.

Diagnosis.—Body, brown above, pale-yellow below. Wings, dark-brown above. Primaries, a large bright-yellow spot at end of cell from subcostal to below vein 2. Secondaries, fringe light gray; a large bright-yellow spot in disk. Underneath, primaries black; the apex and outer margin pale yellow; the base of costa pale yellow; the median spot duller, extending to submedian vein; fringe blackish. Secondaries, pale-yellow; fringe yellow at base, outwardly gray.

Expanse.—Twenty-five millimeters.

Habitat.—Rio Janeiro, Brazil.

Type.—No. 5995, U.S.N.M.

ATRYTONE URQUA, new species.

Diagnosis.—Wings olivaceous brown; a terminal black line; fringe grayish. Primaries, a small round whitish spot between veins 3 and 4. Underneath, somewhat paler. Primaries, another minute spot between veins 6 and 7; a gray streak on outer margin below vein 2. Secondaries, a faintly paler outer curved band; a dark-gray shade from base close to inner margin.

Expanse.—Twenty-seven millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5996, U.S.N.M.

ATRYTONE PARANENSIS, new species.

Diagnosis.—Wings dark brown. Primaries, a faintly paler shade about end of cell, and a similar subapical transverse streak. Secondaries, a black spot at end of cell. Underneath, primaries lighter brown; the apex broadly grayish; a yellowish gray shade below vein 2 on outer margin; some indistinct paler oblique spots from veins 2 to 5. Secondaries, light gray; a velvety black spot at end of cell; a similar spot below vein 2; a broad light brown space from base to anal angle; from veins 2 to 6 a subterminal dark line; a terminal dark shade.

Expanse.—Thirty-one millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5997, U.S.N.M.

ATRYTONE BRASINA, new species.

Diagnosis.—Wings above dark brown; fringe terminally grayish; some olivaceous yellow hairs on secondaries. Primaries, a small quadrate hyaline spot between veins 2 and 3; a smaller spot above vein 3; three minute spots between vein 6 and costa before apex. Underneath, primaries paler, the costa and apex tinged with reddish brown; a whitish space below vein 2 at inner angle. Secondaries, light brown, irrorated with reddish brown; the base and costa very thickly so; a broad median dark-brown shade, not reaching extreme costa, curved and connected with a dark streak on inner margin from base to near anal angle.

Expanse.—Twenty-six millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 5998, U.S.N.M.

THYMELICYUS BAHIENSIS, new species.

Diagnosis.—Wings dull brown; markings fulvous brown. Primaries, the cell fulvous brown; a streak at base of costa; shorter streaks above end of cell; three outer spots between veins 6 to 9;

two small subterminal spots between 4 and 6; some shadings beyond the brand between submedian and vein 4. Secondaries, the disk shaded with fulvous brown cut by the veins. Underneath, similar, the fulvous brown duller.

Expanse.—Twenty-three millimeters.

Habitat.—Bahia, Brazil.

Type.—No. 5999, U.S.N.M.

AUGIADES CHALCONE, new species.

Diagnosis.—*Male*.—Brand, oblique from vein 3 to submedian. Wings brown; fringe light gray. Primaries, base, cell, and costa to outer spots irrorated with ocherous hairs; a small yellow spot in cell above vein 3; an outer row of small dark-yellow spots, obtusely angled between 4 and 6 and forming a continuous shade from vein 3 along brand to submedian vein. Secondaries, olivaceous hairs on basal half; a faint-yellow spot in cell; another row of dark-yellow spots from vein 2 to 7. Underneath olivaceous ocherous; a fine terminal dark line. Primaries, below cell and along inner margin, black; the spots duller, the one between 5 and 6 obsolescent, those below 3 and 2 much broader. Secondaries, a small dull-yellowish spot in cell; the outer row of spots smaller than above and indistinct. Female, wings brown. Primaries, the spots semihyaline white; a small spot in cell; three small outer spots below costa; two between 4 and 6; the spot below 4 inwardly oblique from vein 3; the spot between 2 and 3 larger, inwardly angled, outwardly concave; a small spot at middle of submedian. Secondaries, some olivaceous hairs; an outer row of narrow yellowish spots. Underneath, dull olivaceous brown. Primaries, the costal margin with ocherous hairs; the inner margin and below cell blackish; the spot above submedian much larger, whitish yellow. Secondaries, an outer row of narrow indistinct paler spots.

Expanse.—Male, 30 millimeters; female, 35 millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6000, U.S.N.M.

AUGIADES ANITA, new species.

Diagnosis.—Brand broad, black, oblique from vein 3 to submedian. Wings brown. Primaries, costal margin narrowly dark ocherous with subapical similar irrorations; a small yellow outer spot above vein 6; some irrorations below cell; olivaceous hairs on inner margin; brand followed by a broad ocherous shade to vein 4. Secondaries, olivaceous hairs at base; an ocherous band just below cell from veins 7 to 2 followed by ocherous irrorations. Underneath olive green. Primaries, the lower part of cell, below it, and vein 3 blackish, crossed by a broad

pale-ocherous shade from vein 4 to middle of submedian. Secondaries, a broad white outer band from vein 7 to below vein 2.

Expanse.—Thirty millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6001, U.S.N.M.

AUGIADES TANIA, new species.

Diagnosis.—*Male*.—Brand, as in *A. anita*. Head and thorax greenish. Wings above as in *anita*, but also a small yellow spot in cell at vein 3; the ocherous shade beyond cell narrow. Underneath, primaries as in *A. anita*; also a small yellow spot in cell; the yellow shade does not reach submedian vein. Secondaries olive green; a small, white spot at lower angle of cell; a narrow indistinct paler outer line on which is a white point between veins 3 and 4, and a larger white spot below vein 2.

Expanse.—Twenty-nine millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6002, U.S.N.M.

AUGIADES TURBIS, new species.

Diagnosis.—*Male*.—Brand, as in *A. anita* and *A. tania*. Wings, brown. Primaries, the basal half of costa narrowly ocherous; the brand followed by an ocherous shade forming spots above vein 3; the spots between 4 and 6 small, near outer margin; three spots between vein 6 and costa; a small ocherous spot in cell. Secondaries olivaceous hairs on base; small subterminal yellow spots between veins 3 and 6. Underneath ocherous brown. Primaries, the spots as on upper surface; some black at base. Secondaries a minute yellowish spot at end of cell; a curved outer row of small yellowish spots from veins 2 to 7.

Expanse.—Twenty-eight millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 6003, U.S.N.M.

AUGIADES (?) ALIGULA, new species.

Diagnosis.—*Male*.—Brand black, edged with velvety black, oblique from vein 3 to submedian. Wings bright fulvous, the veins black; some blackish shades at base. Primaries, the outer margin broadly black; a quadrate space beyond cell between veins 4 and 6 to near outer margin, leaving simply two small fulvous spots; from middle to end of cell, the subcostal vein more broadly black; fringe olivaceous, at inner angle fulvous. Secondaries, the outer margin broadly black, more narrowly at anal angle; costa, black, more broadly so on basal half than on outer half; olivaceous shadings on inner margin; fringe

fulvous. Underneath ocherous. Primaries, inner margin and an oblique space below cell black; discocellular and veins 2 and 3, black; broad black subterminal spots below vein 3; a fine terminal grayish line; a curved subterminal row of pale-yellow spots below costa. Secondaries, a faint trace of an outer paler band from near apex to vein 2.

Female.—Wings, brown, irrorated thinly with fulvous hairs; the markings fulvous. Primaries, a spot in cell at vein 3; an outer curved row of spots; three small spots between vein 6 and costa; two small spots nearer outer margin between 4 and 6; three larger spots between vein 4 and inner margin. Secondaries, a small spot in cell; an outer row of elongated yellow spots between the veins. Underneath duller than the male, the outer spots more distinct.

Expanse.—Thirty millimeters.

Habitat.—Petropolis, Brazil.

The brand cut by vein 2.

Type.—No. 6004, U.S.N.M.

PRENES DIDUCA, new species.

Diagnosis.—Wings dark brown; fringe, terminally, lilacine gray. Primaries, a minute yellowish spot between veins 6 and 7. Underneath lighter brown. Primaries, the apex tinged with lilacine; the spot as above. Secondaries, tinged with lilacine; a minute yellowish spot near end of cell, and an outer curved row of similar spots, the largest spot below vein 2.

Expanse.—Twenty-four millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6005, U.S.N.M.

NICONIADES MERENDULA, new species.

Diagnosis.—Head and thorax greenish. Wings brown, fringe darker. Primaries, a yellow spot resting on submedian just beyond brand; other spots hyaline whitish; three outer spots below costa; a large spot across cell above vein 3, inwardly contracted at its middle; a large quadrate spot between 2 and 3; a smaller spot beyond from 3 to 4. Secondaries, some greenish hairs at base; a small round yellow spot in cell; four small subterminal whitish spots between veins 2 and 7. Underneath lighter brown. Primaries, darker at base; the spot above the submedian larger, white. Secondaries, the spots as above, those near outer margin more hyaline.

Expanse.—Thirty-one millimeters.

Habitat.—Castro, Parana, Brazil.

Near *N. merenda* Mabille.

Type.—No. 6006, U.S.N.M.

PHEMIADES JAMAICENSIS, new species.

Diagnosis.—Primaries, bright fulvous; from cell to apex and outer margin broadly blackish brown; fringe, near inner angle, fulvous; a large blackish brown spot toward base from subcostal vein to below vein 2; the fulvous extending into the dark portion above vein 3, forming a few short outer streaks above vein 4. Secondaries, bright fulvous; the outer and costal margins broadly black; the black extending from costal margin to vein 4 at end of cell; fringe fulvous. Underneath primaries, the costal margin, apex, and outer margin reddish brown; a broad subterminal darker shade, becoming black above inner angle; a large black basal space below subcostal vein; a large black spot beyond end of cell. Secondaries, dark reddish brown, paler on outer half; a yellow discal spot; an elongated triangular black spot above anal angle.

Expanse.—Forty-three millimeters.

Habitat.—Jamaica, British West Indies.

Type.—No. 6007; U.S.N.M.

COBALUS FORTIS, new species.

Diagnosis.—*Male*.—Wings dark brown; fringe, terminally, whitish. Primaries, greenish hairs on inner margin; a cluster of yellow scales above middle of submedian vein; spots semihyaline, whitish yellow; a transverse spot in cell contracted at its middle; a large spot between veins 2 and 3; a smaller spot between 3 and 4; three small outer spots below costa. Secondaries, some greenish hairs in and below cell; two outer semihyaline spots between veins 2 and 4. Underneath brown, irrorated with greenish yellow scales on secondaries, also on costa and apex of primaries. Primaries, base darker; spots as above; a large whitish dash below vein 2. Secondaries, the two spots as above; palpi and fore coxæ greenish yellow; abdomen with two central rows of yellowish white spots.

Expanse.—Thirty-nine millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 6008, U.S.N.M.

COBALUS RASTACA, new species.

Dignosis.—*Female*.—Wings light brown; fringe grayish brown. Primaries, spots semihyaline whitish; a minute spot in cell close to vein 3; a small spot between 2 and 3; a smaller round spot between 3 and 4. Underneath light brown. Primaries, spots the same; an outer curved row of five small black spots from veins 4 to 9, the middle spot containing a few white hairs. Secondaries, a blackish lunular streak at end of cell; an outer row of four black spots above vein 2;

the spots above vein 2 and vein 3 with distinct white centers; the spot above 4 with only a few whitish scales; the spots above vein 6 very small, entirely black.

Expanse.—Thirty-eight millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6009, U.S.N.M.

COBALUS ARITA, new species.

Diagnosis.—Wings dark brown. Primaries, an oblique white hyaline spot from veins 2 to 3; a smaller round spot between 3 and 4; a minute spot between 6 and 7. Underneath, not quite so dark. Primaries, base of costa tinged with reddish brown; a pale subterminal spot above submedian vein. Secondaries, tinged with violaceous; a minute yellowish spot near end of cell; a subterminal row of five similar spots above vein 2. Abdomen, below, whitish.

Expanse.—Twenty-six millimeters.

Habitat.—Trinidad, British West Indies.

Type.—No. 6010, U.S.N.M.

EUTYCHIDE ASTIGA, new species.

Diagnosis.—*Male*.—Wings brown. Primaries darker on the inner margin; a small olive spot between veins 2 and 3, and another above vein 3 more outwardly. Underneath, primaries with the costal margin, apex broadly, and outer margin narrowly olivaceous brown, otherwise black; secondaries olivaceous brown; a small black spot between veins 2 and 3, and another between 4 and 5, close to cell, followed by some slightly paler shades.

Expanse.—Twenty-seven millimeters.

Habitat.—Castro, Parana; Petropolis, Brazil.

Type.—No. 6011, U.S.N.M.

EUTYCHIDE PETROVNA, new species.

Diagnosis.—Wings dark brown; fringe grayish brown. Underneath dark brown, thinly irrorated with grayish scales.

Expanse.—Thirty millimeters.

Habitat.—Petropolis, Brazil.

Easily recognized by the position of the brands.¹

Type.—No. 6012, U.S.N.M.

¹ These brands consist of a blackish thickening along vein 1 from center to near base, and on both sides of vein 2 at its base, outward about one-fifth its length. They are thus horizontal and parallel; not strongly defined. The same structure is indicated in *E. astiga* Schaus, but weakly and supplemented by a faint dot of blackish on the submedian fold. In *E. asema* Mabille, an oblique shade joins all these elements producing the usual oblique brand.—HARRISON G. DYAR.

EUTYCHIDE BARNESI, new species.

Diagnosis.—Thorax tinged with dark green. Wings dark brown, tinged with violaceous. Primaries, some white hairs on basal half of inner margin; spots semihyaline, white; a large quadrate spot between veins 2 and 3; a smaller spot near outer margin between 3 and 4; a very small spot below costa, subterminally. Secondaries, fringe at anal angle white; a white spot beyond cell between veins 2 and 4, cut by vein 3, the upper portion longer than the lower portion. Underneath, duller. Primaries, the apex tinged with lilacine gray; some subterminal dark spots between the veins. Secondaries lilacine brown; a dark basal shade; a broad shade from apex to the dark shade along the inner margin; marginal dark spots between the veins.

Expanse.—Thirty millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6013, U.S.N.M.

THOON LUGENS, new species.

Diagnosis.—*Male*.—Wings dark brown; the fringe paler. Primaries, the brand black. Underneath, primaries reddish brown, the inner margin paler. Secondaries, violaceous brown except the inner margin; a minute spot in cell, and some outer similar spots above vein 2, lighter brown like the inner margin.

Expanse.—Twenty-seven millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6014, U.S.N.M.

RHINTHON BOMAX, new species.

Diagnosis.—*Male*.—Wings dark brown. Primaries, a narrow transverse semihyaline white spot from 2 to 3; a small round hyaline spot between 3 and 4. Underneath, dark brown tinged with violaceous. Primaries, the inner angle and outer margin lighter brown. Secondaries, a small yellow spot at end of cell; a yellow outer point between 3 and 4.

Expanse.—Thirty-six millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6015, U.S.N.M.

RHINTHON TANARIS, new species.

Diagnosis.—*Male*.—Wings dark brown. Primaries, a hyaline point between 3 and 4. Underneath, dark brown. Primaries, outer margin and apex broadly lighter brown; the spot as above; a transverse pale streak between 2 and 3. Secondaries shaded with violaceous above median and vein 2.

Expanse.—Thirty-six millimeters.

Habitat.—Tijuca, Brazil.

Type.—No. 6016, U.S.N.M.

EUROTO ETELKA, new species.

Diagnosis.—Wings dark brown; fringe terminally grayish. Primaries, small semihyaline white spots; one beyond band between 2 and 3; one beyond, between 3 and 4; three outer spots below apex. Underneath brown. Primaries with the outer margin tinged with violaceous, the spots large. Secondaries, the inner margin light brown, otherwise tinged with violaceous; the veins light brown; a small lilacine spot at end of cell; a median row of lilacine spots from veins 4 to 7; an outer row from veins 2 to 7.

Expanse.—Twenty-eight millimeters.

Habitat.—Trinidad, British West Indies.

Type.—No. 6017, U.S.N.M.

EUROTO PURGIS, new species.

Diagnosis.—*Male*.—Wings, above, dark brown. Underneath, primaries dark brown. Secondaries dark-reddish brown; a small white shade at end of cell; a small whitish outer shade below vein 2; a large subterminal white spot between 4 and 6; two small white spots between 2 and 4.

Expanse.—Twenty-seven millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6018, U.S.N.M.

EUROTO COLER, new species.

Diagnosis.—*Male*.—Wings dark brown. Secondaries, inner margin blackish. Underneath, dark brown. Secondaries, some minute outer clusters of yellowish scales between veins 2 and 6.

Expanse.—Twenty-five millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 6019, U.S.N.M.

EUROTO RITANS, new species.

Diagnosis.—*Male*.—Wings dark brown; the band extending below median to vein 3. Underneath, dark brown; the secondaries tinged with reddish; a small yellow outer spot between 6 and 7; one between 2 and 3, and another between 3 and 4.

Expanse.—Twenty-five millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6020, U.S.N.M.

PHLEBODES CHITTARA, new species.

Diagnosis.—*Male.*—An oblique black brand from vein 3 to submedian, above which it is linear. Wings dark brown, fringe grayish. Primaries, the spots semihyaline white; a spot between veins 2 and 3; a smaller spot between 3 and 4; a small round spot between 6 and 7; some yellow scales close to brand on submedian vein. Secondaries, two small faint spots beyond cell. Underneath, primaries with the costa and apex irrorated with yellowish gray scales; the spots as above. Secondaries yellowish gray; a small white spot at lower angle of cell; three small round white outer spots; one above vein 2, one above vein 3, and one below vein 6.

Expanse.—Twenty-nine millimeters.

Habitat.—Trinidad.

Type.—No. 6021, U.S.N.M.

PHLEBODES GULALA, new species.

Diagnosis.—*Male.*—Brand curved slightly from vein 3 to submedian, where it ends in a point. Wings dark brown; fringe grayish. Primaries, some yellow hairs between veins on costal margin above cell; a yellow dash on submedian following brand; a semihyaline spot from veins 2 to 3, and a smaller spot above vein 3, both outwardly concave. Secondaries, some olivaceous hairs; a yellow outer shade between 3 and 4. Underneath, olivaceous brown. Primaries, inner margin broadly blackish; the dash on submedian whitish. Secondaries, two small yellow outer spots between veins 2 and 4.

Expanse.—Thirty-four millimeters.

Habitat.—Tijuca, Brazil.

Type.—No. 6022, U.S.N.M.

PHLEBODES METONIDIA, new species.

Diagnosis.—Body, brown above; abdomen, gray below; palpi mottled, with yellow scales. Wings dark brown. Primaries, basal half of costa ocherous; an outer row of bright yellow spots, those between veins 4 and 6 very small, incurved below cell and close to brand. Secondaries, with greenish ocherous hairs; an outer row of small ocherous spots. Primaries, below, with the base and inner margin blackish; the costa and apex to vein 3, dull ocherous; the spots as above, but duller. Secondaries below ocherous, the veins yellow; the outer spots very indistinct.

Expanse.—Twenty-seven millimeters.

Habitat.—Tijuca, Brazil.

Type.—No. 6023, U.S.N.M.

PHLEBODES FARTUGA, new species.

Diagnosis.—*Male.*—Wings dark brown, fringe pale buff. Primaries, spots bright yellow; a small one above submedian; a larger one between veins 2 and 3; a small one between 3 and 4, and a point between 6 and 7. Secondaries with some ochereous brown hairs. Underneath, violaceous brown; the veins, pale ochereous. Primaries, cell and inner margin blackish; no spot above submedian; other spots as on upper surface. Abdomen, below, yellow.

Expanse.—Twenty-four millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 6024, U.S.N.M.

OEONUS GARIMA, new species.

Diagnosis.—Wings dark brown; fringe grayish brown. Primaries, some minute hyaline spots; one between veins 6 and 7; two spots at end of cell; a narrow spot from veins 3 to 4, contracted in its middle; a quadrate spot placed more outwardly between veins 3 and 4; a small whitish spot above submedian, following brand; the brand velvety black, linear, broken into three parts. Underneath, pale olivaceous brown. Primaries, blackish at base below costa; the spot above submedian vein larger. Secondaries, a small whitish spot at end of cell; a curved outer row of six small whitish spots between the veins.

Expanse.—Twenty-seven millimeters.

Habitat.—Trinidad, British West Indies.

Type.—No. 6025, U.S.N.M.

PHANIS CUMBRE, new species.

Diagnosis.—*Male.*—Wings brown, fringe grayish brown. Primaries, spots semihyaline white; a large spot from vein 2 to 3, a smaller spot beyond it above vein 3; three small spots between vein 6 and costa. Underneath, primaries similar; the costal margin shaded with reddish brown; the apex and outer margin to vein 3 shaded with dark gray. Secondaries underneath, grayish brown; the median space darker, tinged with reddish brown, preceded by a small pale spot at end of cell, and followed by a curved row of indistinct paler spots; veins and a terminal line darker.

Expanse.—Twenty-six millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6026, U.S.N.M.

PHANIS TAVOLA, new species.

Diagnosis.—*Male.*—Wings dark brown. Primaries with hyaline whitish spots; a large one between 2 and 3; a smaller one beyond, between 3 and 4; a minute spot between 6 and 7. Underneath, pri-

maries blackish at base; the costa and apex tinged with reddish; the spots as above. Secondaries, tinged with reddish; a small subterminal grayish spot, very small, between 3 and 4.

Expanse.—Thirty millimeters.

Habitat.—Trinidad, British West Indies.

Type.—No. 6027, U.S.N.M.

MUCIA MATALMA, new species.

Diagnosis.—*Male*.—Brand narrow, blackish, from origin of vein 3 to vein 2; below vein 2 a longitudinal streak, and below this a linear brand to submedian; a semihyaline spot beyond brand, above vein 2, and a smaller spot between veins 3 and 4. Underneath olivaceous brown. Primaries dark brown on basal half; a slightly paler marginal shade below vein 2. Secondaries, the costal margin somewhat darker; an outer black point between veins 6 and 7; an outwardly oblique row of thin black spots from vein 2, the spots above veins 2 and 3 the largest.

Expanse.—Thirty-four millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6028, U.S.N.M.

CATIA MINAYA, new species.

Diagnosis.—*Male*.—An elongated black brand at lower angle of cell; a small round black brand above submedian; the two brands connected and followed by thick grayish scales. Wings dark brown; fringe grayish. Primaries, an indistinct small pale spot between veins 3 and 4; some reddish brown scales on base of costa; olivaceous hairs on inner margin. Secondaries, with some olivaceous hairs. Underneath, primaries blackish; inner margin dark gray; costal margin and apex reddish brown; a small pale spot between 3 and 4 and a fainter spot below vein 3. Secondaries reddish brown; a median darker shade, preceded by a faint paler spot in cell, and followed by a faint paler shade from vein 6 to just below vein 2.

Expanse.—Twenty-seven millimeters.

Habitat.—Tijuca, Brazil.

Allied to *C. druryi* Latreille.

Type.—No. 6029, U.S.N.M.

EUPHYES MENOPIS, new species.

Diagnosis.—*Male*.—Brand narrow, black, from vein 3 to submedian. Wings blackish brown. Primaries, basal half shaded with olivaceous ocher; basal half of costa yellow; a yellow spot at upper angle of cell; three elongated yellow outer spots below costa; brand followed by a

yellow shade from submedian to vein 4. Secondaries, some olivaceous hairs; some faint outer dark ochereous dashes. Underneath, primaries blackish at base, in, and below cell; spots paler and duller; outer margin reddish brown, also between 4 and 6 from within end of cell; costal margin broadly yellowish; reddish brown before and beyond outer spots; a subterminal black shade below vein 3. Secondaries, the inner margin broadly dark gray; the base and outer margin reddish brown; the median space tinged with yellow; an irregular subterminal row of dark spots from apex to below vein 2; also basal and median outer spots, those below cell and near outer margin violaceous, the others reddish brown.

Expanse.—Twenty-two millimeters.

Habitat.—Peru.

Type.—No. 6030, U.S.N.M.

MNASALCAS AMATALA, new species.

Diagnosis.—*Male*.—A long brand below cell from veins 2 to 3; a small longitudinal line below vein 2, and an oblique line below this to submedian. An oblique brand at base of secondaries. Wings dark brown. Underneath, brown. Primaries, two thirds of costal margin broadly, cell and basal half of inner margin darker; an indistinct row of paler spots from vein 2, around the dark portion. Secondaries, dark violaceous brown on basal two-thirds; some very indistinct outer paler spots.

Expanse.—Thirty-one millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 6031, U.S.N.M.

PAPIAS TRISTISSIMUS, new species.

Diagnosis.—*Male*.—Entirely dark brown. Underneath, similar; the inner margin of primaries paler.

Expanse.—Thirty-seven millimeters.

Habitat.—Peru.

Type.—No. 6032, U.S.N.M.

PAPIAS CTYANUS, new species.

Diagnosis.—Vertex and palpi with yellowish hairs. Abdomen dark-brown above, light brown below. Wings, dark brown. Underneath reddish brown; the inner area of primaries blackish; on secondaries a broad space near inner margin light brown.

Expanse.—Twenty-seven millimeters.

Habitat.—Trinidad, British West Indies; Nova Friburgo, Brazil.

Type.—No. 6033, U.S.N.M.

PAPIAS SOBRINUS, new species.

Diagnosis.—Wings, dark brown; base of fringe blackish, outwardly gray. Underneath, dark brown. Primaries, a faint outer row of small grayish spots curved beyond cell; the inner margin paler. Secondaries, an outer row of small dark-ochreous spots; fringe as above.

Expanse.—Twenty-seven millimeters.

Habitat.—Rio Janeiro, Brazil.

Type.—No. 6034, U.S.N.M.

LERODEA TESERA, new species.

Diagnosis.—*Male*.—Wings brown; fringe, brown, mottled with gray. Primaries, the base of costa grayish; small hyaline white spots; two superposed in cells; one between veins 2 and 3; one between 3 and 4; three from costa to vein 6. Underneath, primaries with apex irrorated with lilacine; inner margin, broadly grayish; fringe paler. Secondaries, thickly irrorated with lilacine; a brownish median spot on costa; one below cell at base; a brownish broad outer shade cut by the veins; some indistinct marginal spots.

Expanse.—Twenty-eight millimeters.

Habitat.—Rio Janeiro, Brazil.

Type.—No. 6035, U.S.N.M.

VEHILIUS ALMONEUS, new species.

Diagnosis.—Palpi gray below. Body brown. Abdomen underneath buff. Wings brown; fringe blackish at base, outwardly pale buff. Primaries, markings bright yellow; a median spot in cell just below subcostal; a curved outer row of spots from costa to submedian. Secondaries, an outer row of elongated yellow spots above vein 2. Underneath brown, the veins pale yellow. Primaries, the spots as above, except there is no spot below vein 2. Secondaries, the spots more numerous, starting below vein 2, pale yellow.

Expanse.—Twenty-four millimeters.

Allied to *V. venosus* Plötz.

Habitat.—Peru.

Type.—No. 6036, U.S.N.M.

VEHILIUS CARASTA, new species.

Diagnosis.—*Male*.—Wings, dark brown. Primaries, a curved outer row of minute clusters of yellow scales from costa to vein 2. Underneath brown, tinged with violaceous. Primaries, some yellow scales at base of costa; two small yellow spots in cell; the outer row of spots more distinct; a marginal yellow line, outwardly lunular and connected inwardly with intervening yellow streaks. Secondaries, the

marginal lines as on primaries; the inner margin broadly dark gray, irrorated with yellow; a spot in cell; a median spot between 7 and 8; an outer row of spots from below vein 2 to vein 7.

Female, similar.

Expanse.—Twenty-four millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6037, U.S.N.M.

VEHILIUS CHINTA, new species.

Diagnosis.—*Male*.—Wings dark brown; fringe grayish buff. Primaries, the spots small, indistinct, yellowish gray; three minute spots near costa before apex; one above submedian, one between veins 2 and 3, and another between 3 and 4. Secondaries, with some paler brown hairs. Underneath brown, the veins paler. Primaries, the costal spots lilacine; a paler space at inner angle. Secondaries, an outer wavy lilacine band, not extending below vein 2; the inner margin broadly lighter brown. Abdomen below grayish.

Expanse.—Twenty-two millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6038, U.S.N.M.

MEGISTIAS EORIUS, new species.

Diagnosis.—Wings dark brown; fringe basally black, outwardly gray; some clusters of yellow scales outwardly on both wings between the veins, almost imperceptible. Underneath, primaries black; some ocherous scales on costa and at apex; a whitish outer band from vein 6 to costa. Secondaries, the basal half of costa, and a shade from middle of inner margin, broadening to outer margin at vein 3, and then to apex dark brown with some ocherous scales; the intermediate inner space and anal space lilacine, irrorated with white scales; the inner margin light brown.

Expanse.—Twenty-one millimeters.

Allied to *M. telata* Herrich-Schaeffer.

Habitat.—Castro, Parana, Brazil.

Type.—No. 6039, U.S.N.M.

MEGISTIAS RANESUS, new species.

Diagnosis.—Palpi and head with reddish hairs. Wings dark brown; fringe paler. Primaries below, dark brown; the inner margin paler; some lilacine scales on outer margin from vein 4 to apex; some ocherous red on costa at base and before apex. Secondaries, below, with the anterior half reddish brown; an ocherous red spot at base; the posterior half brown irrorated with lilacine scales; a subterminal reddish

line; some lilacine scales below cell toward base; a lighter brown space near inner margin from base to anal angle.

Expanse.—Male, 20 millimeters; female, 24 millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 6040, U.S.N.M.

MEGISTIAS POLISTION, new species.

Diagnosis.—Wings dark brown; fringe buff. Primaries, a semi-hyaline whitish spot between veins 2 and 3, and smaller ones between 3 and 4; some olivaceous scales on base of costa; a cluster of yellowish scales above middle of submedian vein; minute clusters of similar scales obliquely from costa before apex. Underneath, light olivaceous brown. Primaries, a black shade from base to hyaline spots; an outer row of small yellowish buff spots; a similar spot in the cell.

Expanse.—Twenty-seven millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6041, U.S.N.M.

MEGISTIAS MONESTES, new species.

Diagnosis.—Wings dark brown; fringe pale. Primaries, a very indistinct outer row of grayish brown spots. Underneath, dull gray, with blackish brown markings. Primaries, basal half entirely dark; elongated spots beyond cell between veins 4 and 6; elongated marginal spots between 2 and 4; apical spots above vein 6; a terminal blackish line. Secondaries, a median dark shade cut by veins, and darkest above cell; an outer row of dark spots close to cell, from below vein 2 to vein 7, followed by a lighter brown shade; the outer margin brown, leaving subterminal grayish spots; a terminal black line; the inner margin without markings.

Expanse.—Twenty-eight millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 6042, U.S.N.M.

MEGISTIAS MIABA, new species.

Diagnosis.—Wings dark brown; fringe grayish. Primaries, a minute whitish spot between 2 and 3, 3 and 4, and 6 and 7. Underneath, primaries with cell and inner margin blackish; costa, apex, and outer margin light brown, the veins yellowish; spots as above; a pale dash below vein 2. Secondaries light brown; the veins yellowish; a whitish point at end of cell; a row of outer white points from veins 2 to 7.

Expanse.—Twenty-nine millimeters.

Habitat.—Not known.

Type.—No. 6043, U.S.N.M.

MEGISTIAS CHULA, new species.

Diagnosis.—Wings dark brown; the fringe grayish. Primaries, the veins tinged with green; a yellowish spot close above middle of submedian; a round semihyaline white spot between 2 and 3; a smaller spot between 3 and 4. Secondaries, the costa tinged with violaceous. Underneath, primaries dark brown; the costa reddish brown; the outer margin lilacine; the spots as above. Secondaries lilacine; the costa broadly violaceous; the inner margin broadly grayish buff; a small round white spot at end of cell; an indistinct curved outer row of small whitish spots from below vein 2 to vein 7.

Expanse.—Twenty-seven millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6044, U.S.N.M.

MEGISTIAS VANILIA, new species.

Diagnosis.—Wings dark brown, the fringe paler; underneath, light violaceous brown. Primaries, the costa tinged with green; inner margin broadly grayish black; a paler dash below vein 2; a yellow point between veins 6 and 7. Secondaries, the inner margin broadly and thickly irrorated with yellowish scales; a yellow point at end of cell; an outer curved row of small yellow spots from below vein 2 to vein 7, the end spots slightly larger.

Expanse.—Twenty-eight millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6045, U.S.N.M.

MEGISTIAS GISPARA, new species.

Diagnosis.—*Male*.—Wings dark brown; fringe grayish. Primaries, some ochereous scales on basal half of costa, and a few at apex; a curved outer row of small, indistinct grayish spots from costa to vein 2, those between 4 and 6 almost obsolete. Secondaries with lighter brown hairs. Underneath, light brown, faintly tinged with ochreous. Primaries, the inner margin broadly blackish; the outer spots as above. Secondaries, a black point between 2 and 3 near cell; a similar point just above vein 4 close to discocellular, followed by a faint paler curved outer shade.

Expanse.—Twenty-nine millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6046, U.S.N.M.

MEGISTIAS VORGIA, new species.

Diagnosis.—Wings dark brown; fringe grayish. Primaries, a small semihyaline white spot between veins 2 and 3; a smaller one between 3 and 4; three minute outer spots below costa. Underneath, primaries with cell and inner margin broadly black; costa, apex, and outer

margin to vein 3 brownish buff; the veins and intervening streaks yellowish. Secondaries brownish buff; the veins yellowish; indistinct grayish intervening streaks; four small outer whitish spots from veins 2 to 7.

Expanse.—Twenty-eight millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 6047, U.S.N.M.

MEGISTIAS SANCOYA, new species.

Diagnosis.—*Male*.—Wings dark brown. Primaries, a darker shade from vein 2 and cell obliquely toward apex. Underneath brown tinged with ocherous. Secondaries, a small dark brown spot just beyond cell between 4 and 6; a very indistinct brownish outer shade above vein 2.

Expanse.—Thirty millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6048, U.S.N.M.

MEGISTIAS CARINNA, new species.

Diagnosis.—Wings dark brown; fringe terminally reddish brown. Primaries, slightly darker about end of cell. Underneath, primaries violaceous brown; the outer margin tinged with lilacine; a light brown space at inner angle. Secondaries violaceous brown tinged with lilacine below cell and on outer margin; a lighter brown space near inner margin from base widening to anal angle; a curved outer row of small lilacine white spots.

Expanse.—Twenty-three millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 6049, U.S.N.M.

MEGISTIAS JAMACA, new species.

Diagnosis.—Wings dark brown; a few ocherous hairs at base; fringe grayish. Primaries, small semihyaline spots; one between veins 3 and 4, three small spots between veins 6 and 9. Underneath paler, only the cell and inner margin of primaries darker; the spots as above; a small grayish spot between veins 2 and 3. Secondaries, an outer row of small grayish spots from vein 2 to vein 7.

Expanse.—Thirty-one millimeters.

Habitat.—Jamaica, British West Indies.

Type.—No. 6050, U.S.N.M.

MEGISTIAS (?) CORESCENE, new species.

Diagnosis.—Wings dark brown. Primaries with small hyaline spots; three outer spots below costa; a small spot between 2 and 3, and another between 3 and 4. Underneath brown. Primaries, the

outer margin lilacine, widest at vein 5. Secondaries tinged with lilacine, leaving an apical space; a curved median space, and some subterminal spots, brownish.

Expanse.—Twenty-four millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 6051, U.S.N.M.

LEREMA COYANA, new species.

Diagnosis.—*Male*.—Wings dark brown. Primaries faintly tinged with green at base; brand dark gray; a minute hyaline spot between 3 and 4; another minute spot between 6 and 7. Underneath reddish brown. Primaries, the base below costa blackish; a grayish brown space at inner angle. Secondaries, small whitish outer spots; two between 2 and 4, one between veins 6 and 7.

Expanse.—Thirty-three millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6052, U.S.N.M.

LEREMA STACARA, new species.

Diagnosis.—*Male*.—Wings brown; a terminal darker line, fringe paler. Primaries, some olivaceous hairs on inner margin; brand grayish black. Secondaries, some olivaceous hairs. Underneath brown. Primaries, the costa, apex, and outer margin olivaceous brown; the inner margin whitish yellow, extending above vein 2 before outer margin. Secondaries olivaceous brown, with duller brown markings; a short inner line and spot; an irregular median row of small spots to a broad shade from apex to below vein 2 and end of cell; some marginal shades; a terminal dark line.

Female.—Primaries with hyaline white spots; three outer spots below costa; a large spot between 2 and 3; a small spot between 3 and 4. Underneath, primaries dark at base; a large whitish spot below vein 2; costa, apex, and outer margin light brown irrorated with greenish yellow scales. Secondaries light brown irrorated with greenish yellow scales; an inner dark line; a median dark streak from 7 to 8; an oblique dark shade from 2 to 7, followed by small indistinct yellowish spots.

Expanse.—Male, 33 millimeters; female, 34 millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6053, U.S.N.M.

LEREMA ELGINA, new species.

Diagnosis.—*Male*.—A long brand below cell from vein 3 to 2 and then on to submedian, nearly straight, and edged finely with blackish. Wings dark brown; fringe blackish at base, outwardly light brown. Primaries, a small hyaline spot between veins 3 and 4, and one between

6 and 7. Underneath, primaries with the costal margin and apex tinged with reddish brown. Secondaries dark reddish brown; a small yellow outer spot between veins 3 and 4, and one between 6 and 7.

Expanse.—Thirty-seven millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 6054, U.S.N.M.

PADRAONA SARTIA, new species.

Diagnosis.—Primaries dark brown; basal half of costa light ocherous brown; spots pale yellow, semihyaline, edged with darker yellow; three small spots below costa before apex; a large quadrate spot between veins 2 and 3, and a smaller one above, between veins 3 and 4; a yellow streak above submedian vein; some ocherous brown hairs at base and on inner margin. Secondaries, the costa broadly dark brown; the outer margin black; a pencil of black hairs on inner margin; the disc dark ocherous brown with some small subterminal yellow spots. Underneath, primaries black; the costal margin, apex broadly, and outer margin to vein 3 reddish brown; the spots as above. Secondaries reddish brown at base and on outer margin; a broad black shade near inner margin from base to outer margin near anal angle; the inner margin and subterminal space ocherous; a velvety black spot beyond cell above vein 4 followed by a large white spot; two small white spots above it near outer margin and two below it; an elongated large white spot below vein 2.

Expanse.—Twenty-seven millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6055, U.S.N.M.

PADRAONA CALCAREA, new species.

Diagnosis.—*Male*.—Wings dark brown. Primaries, a bright fulvous band cut by veins from middle of submedian, narrowing toward vein 5, before which it is angled and interrupted, broad between 5 and 6, narrow between 6 and 7. Secondaries, an oblique orange mark from veins 2 to 5 near outer margin. Underneath light brown, the veins pale. Primaries, some black in cell and above inner angle; the fulvous spot as above, but duller. Secondaries, the orange spots almost effaced, but extending below vein 2; a dark shade along inner margin, widening at anal angle.

The female has the band broken into spots, which are white, except the spot below vein 2, which is geminate and yellow; the spots on secondaries are smaller.

Expanse.—Male, 30 mm.; female, 33 mm.

Habitat.—Petropolis, Brazil.

Type.—No. 6056, U.S.N.M.

PADRAONA (?) RADIATA, new species.

Diagnosis.—Abdomen brown, banded with yellow laterally. Wings dark brown, with bright yellow markings. Primaries, a broad streak on basal half of costa; a streak below submedian, and one above it terminating in a large spot below vein 2; at base of vein 2 is a small round brand followed by a quadrate spot surmounted by a small spot in cell; these and the following two spots have pale yellow centers. A small spot between 3 and 4; a small spot between 6 and 7; a few bright yellow scales on costa at two-thirds from base. Secondaries, the lower portion of cell and a space beyond cell bright yellow, leaving a small portion of wing broadly dark brown, and inclosing a small brown spot between veins 2 and 3, close to cell. Underneath, primaries black; the costa, apex broadly, and outer margin to vein 3 light brown, with darker streaks between the veins, which are bright yellow. Secondaries bright violaceous brown; the veins pale yellow; a broad black space close to inner margin, widening at anal angle; fringe black at base, outwardly gray.

Expanse.—Thirty millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6057, U.S.N.M.

HESPERIA (?) SUCOVA, new species.

Diagnosis.—*Male*.—No brand; a long tuft of hairs below median vein at base. Wings dark brown, fringe paler. Primaries, a darker shade at end of cell. Underneath, primaries blackish at base, violaceous brown on costa and apex; a few whitish hairs between veins 3 and 4. Secondaries violaceous brown; a curved outer row of small spots consisting of clusters of gray hairs.

Expanse.—Twenty-nine millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6058, U.S.N.M.

HESPERIA (?) ALTAMA, new species.

Diagnosis.—*Male*.—A blackish brand between veins 2 and 3 at origin of vein 3. Wings dark brown above, underneath bluish gray. Primaries, a small white streak in cell; posterior portion of cell a shade below it and a curved band from cell between veins 2 and 3 to inner angle black; a broad whitish space on inner margin. Secondaries, a lilacine shade from base to anal angle.

Female.—Lighter brown; an olivaceous shade on secondaries. Primaries, a curved row of hyaline whitish spots from vein 2 toward costa, diminishing in size; three spots from veins 2 to 5; two spots between veins 6 and 8. Underneath the blue shade predominates.

Primaries, the base of cell and inner margin brown. Secondaries, the space from base to anal angle more roseate; an indistinct outer row of pale spots.

Expanse.—Male, 34 mm.; female, 40 mm.

Habitat.—Castro, Parana, Brazil.

Type.—No. 6059, U.S.N.M.

HESPERIA (?) CALIGULA, new species.

Diagnosis.—*Male*.—Brand, a fine streak on discocellular; a large round spot between vein 2 and cell. Wings dark brown, the fringe paler. Underneath olivaceous brown. Primaries, a darker discocellular streak; a darker space in cell and along part of vein 2 to base; a broad pale yellow space on inner margin before apex. Secondaries, a broad subterminal white band from apex to inner margin above angle, interrupted by a paler olivaceous space near inner margin, which extends from base to anal angle.

Expanse.—Thirty-three millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 6060, U.S.N.M.

HESPERIA (?) MISERA, new species.

Diagnosis.—*Male*.—A long narrow brand below cell from veins 3 to 2, then twice interrupted before submedian. Wings dark brown, fringe blackish. Underneath a richer brown. Secondaries, a small yellow outer spot between veins 6 and 7 and a still smaller one between veins 3 and 4.

Expanse.—Forty millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6061, U.S.N.M.

CALLIMORMUS DIAESES, new species.

Diagnosis.—Body brown; abdomen below gray. Wings dark brown, the fringe paler; a few clusters of yellow scales outwardly on primaries. Underneath brown tinged with violaceous. Primaries, the veins at apex and outer margin yellow. Secondaries, the veins and discocellular yellow; an outer row of small whitish spots from veins 2 to 8.

Expanse.—Nineteen millimeters.

Habitat.—Southeast Brazil.

Type.—No. 6062, U.S.N.M.

CALLIMORMUS VERAMES, new species.

Diagnosis.—Body brown; abdomen below yellowish with a black ventral line. Wings dark brown, fringe paler. Primaries, an outer row of clusters of olivaceous scales; some olivaceous scales along

subcostal. Underneath, primaries brown, the inner margin paler; terminal yellow line; veins 5 to 12 and subcostal bright yellow; veins 2 to 4 yellow on outer margin; a yellow streak in cell. Secondaries violaceous; the veins and a terminal line bright yellow; inner margin broadly irrorated with yellow; a basal yellow line on extreme costa; a subterminal row of small yellow spots. Fringe on both wings black basally, grayish brown outwardly.

Expanse.—Twenty-two millimeters.

Habitat.—Peru.

Type.—No. 6063, U.S.N.M.

MNESTHEUS PETROVNA, new species.

Diagnosis.—*Male*.—Wings dark brown; fringe black at base, outwardly gray. Primaries, a triangular yellow spot above middle of submedian; four semihyaline yellow spots; a large one between veins 2 and 3, and a minute spot above it in cell; an outer small spot between 3 and 4; a very small spot between 6 and 7; some yellow scales at base of costa. Secondaries, yellowish hairs on discal area; olivaceous hairs near inner margin; some yellow outer scales between veins 4 and 7. Underneath, primaries dark brown, the spots as above; veins yellow along outer margin and apex, also above subcostal. Secondaries, violaceous; inner margin broadly brown, edged with yellow; veins yellow, except veins 3 and 6 at their base; an outer yellow wavy line from below vein 2 to vein 4.

Expanse.—Twenty-six millimeters.

Habitat.—Petropolis, Brazil.

Type.—No. 6064, U.S.N.M.

CYMÆNES NUX, new species.

Diagnosis.—Wings dark brown. Primaries, some white transparent spots; a median spot above submedian vein; a larger spot between veins 2 and 3; a smaller spot between 3 and 4; a very small spot between 6 and 7. Secondaries, the fringe white. Underneath, primaries blackish brown; the apex broadly light brown, shaded with gray between veins 3 and 6; the spot above submedian larger, opaque. Secondaries whitish, irrorated with brown striæ; the costal margin brown; a large dark spot below end of cell, cut by veins 2 and 3.

Expanse.—Thirty-five millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 6065, U.S.N.M.

CYMÆNES DUBITANS, new species.

Diagnosis.—*Male*.—Wings dark brown. Primaries, a faint oblique shade beyond cell, between veins 2 to 4, light brown. Underneath olivaceous brown. Primaries, the inner margin grayish brown.

Secondaries, the outer margin from veins 2 to 5 tinged with violaceous; the costa darker; a darker shade from beyond cell to costa before apex.

The female is dark brown above with a faint paler shade at end of cell on primaries. Underneath there is a paler triangular space on inner margin.

Expanse.—Twenty-nine millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 6066, U.S.N.M.

CYMÆNES INTERMEDIA, new species.

Diagnosis.—*Male*.—Wings dark brown. Primaries, a light olivaceous brown shade from middle of submedian vein to vein 4 at end of cell. Secondaries, some light olivaceous brown hairs. Underneath, primaries dull brown, the inner margin not paler. Secondaries dull olivaceous gray, thickly irrorated with brown striæ; the costa darker; a dark shade from below end of cell to apex.

The female is darker above.

Expanse.—Twenty-eight millimeters.

Habitat.—Tijuca, Brazil.

Type.—No. 6067, U.S.N.M.

CYMÆNES OCCULTA, new species.

Diagnosis.—*Male*.—Wings above dark brown; the base of fringe blackish. Underneath dull brown, tinged with reddish. Primaries, the inner margin broadly light brown. Secondaries, a darker shade from vein 2 to apex; the inner margin lighter brown.

Female.—Similar to the male.

Expanse.—Twenty-nine millimeters.

Habitat.—Rio Janerio, Brazil.

Type.—No. 6068, U.S.N.M.

FLACCILLA(?) COATEPECA, new species.

Diagnosis.—Head reddish brown. Collar and thorax violaceous brown. Wings brown. Primaries with hyaline white spots; a small longitudinal spot in cell; a large spot below it and vein 2; a narrow subterminal spot from 3 to 4 surmounted by an oblong spot between 4 and 5; two small quadrate spots between 6 and 8. Underneath dark brownish red. Primaries, the cell and inner margin blackish brown; the spots as above. Secondaries, a blackish brown space near inner margin from base to anal angle.

Expanse.—Forty-two millimeters.

Habitat.—Coatepec, Mexico.

Type.—No. 6069, U.S.N.M.

FLACCILLA(?) ERGOLA, new species.

Diagnosis.—Palpi, head, collar, and thorax rufous. Wings brown. Primaries, basal third of costa rufous; semihyaline, yellow; a large spot between veins 2 and 3; a narrow subterminal spot between 3 and 5 cut by vein 4. Underneath, primaries black; the costa, apex broadly, and outer margin to vein 2 rufous; the spots as above. Secondaries reddish brown, darkest along costa, and a broad outer shade to below vein 2; the cell light violaceous.

Expanse.—Thirty-seven millimeters.

Habitat.—Nova Friburgo, Brazil.

Type.—No. 6070, U.S.N.M.

THRACIDES ORUSCA, new species.

Diagnosis.—Longer hairs below median vein and on inner margin. Wings brown, palest at the base. Primaries, spots semihyaline, white; a small spot in cell before vein 3; a quadrate spot resting on middle of submedian vein; a large oblique spot from 2 to 3, widest on vein 2; a spot from 3 to 4 outwardly concave; a smaller spot from 4 to 5, and minute spot just above 5; three small spots from costa to vein 6. Secondaries, three yellowish white spots between 2 and 6, in a line from vein 2 towards apex. Underneath, primaries brown; inner margin grayish; basal half of costa buff; a reddish brown spot before costal spots; an apical lilacine streak; the spot above submedian irrorated with white. Secondaries, the base, inner margin, and from below cell along vein 2 to outer margin shaded with lilacine; the basal portion limited by a faint pale line curved inwardly from vein 2 to costal margin near apex, followed by an olivaceous brown space, limited below by the transverse spots which are rather smaller; before inner margin a broad light brown space to anal angle.

Expanse.—Forty millimeters.

Habitat.—Petropolis, Brazil.

Allied to *T. salivus* Cramer.

Type.—No. 6071, U.S.N.M.

THRACIDES BAJULA, new species.

Diagnosis.—*Male*.—Head, thorax, and base of abdomen dark blue. Palpi, inwardly, buff. Wings dark brown. Primaries, basal third metallic blue-green; two semihyaline white spots; a spot in the cell, outwardly indentate, crossed by a fine line; the other spot below vein 2 and end of cell, slightly prolonged along vein 2 toward outer margin. Secondaries, base of wing with metallic blue hairs; on both wings a terminal darker shade; fringe lighter brown. Underneath, wings

brown. Primaries, basal third of costa, white, tinged with metallic scales at base; yellow scales at apex; a large white spot at inner angle. Secondaries, basal third of costa white.

Expanse.—Forty-one millimeters.

Habitat.—Nova Friburgo, Brazil.

Allied to *T. molion* Godman.

Type.—No. 6072, U.S.N.M.

THRACIDES BISERTA, new species.

Diagnosis.—A long brand on submedian. Primaries, dark brown, the spots hyaline white; the brand on submedian pale grey; a geminate elongated spot in cell divided by a dark longitudinal line; a large spot between 2 and 3; a small spot between 3 and 4, outwardly concave; three small outer spots between costa and vein 6. Secondaries, light ochroeous brown; the costa broadly violaceous brown; a small pale spot at end of cell; three small outer spots paler, the upper spot semihyaline, between 2 and 6. Underneath, duller brown. Primaries, the spots as above. Secondaries, the spots as above more distinct; above vein 2 and median the wing shaded with violaceous.

Expanse.—Thirty-seven millimeters.

Habitat.—Trinidad.

Type.—No. 6073, U.S.N.M.

PERICHARES TRIPLAGA, new species.

Diagnosis.—*Male*.—Body brown; thorax and abdomen, basally shot with dark blue. Wings brown, some dark blue at base. Primaries, a long brand from vein 3 to submedian; three semihyaline yellow spots; a quadrate spot in cell; a triangular spot between veins 2 and 3; a smaller quadrate spot from vein 3 to 4; fringe at inner angle yellowish. Secondaries, fringe yellow from costa to near angle, then dark brown at anal angle and on inner margin. Underneath, primaries brown, darkest at base; a yellow costal spot surmounting discal spot; from end of cell to apex shaded with lilacine. Secondaries, a pale space from costa across base, along inner margin for two thirds, followed by a dark brown space becoming paler towards outer margin, and interrupted by a subterminal lilacine shade.

Expanse.—Forty-nine millimeters.

Habitat.—Castro, Parana, Brazil.

Type.—No. 6074, U.S.N.M.

A REVIEW OF THE TRACHINOID FISHES AND THEIR SUPPOSED ALLIES FOUND IN THE WATERS OF JAPAN.

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In the present paper is given an account of the fishes of Japan belonging to families which have been regarded hitherto as allied to the Trachinidæ. The material examined was for the most part collected by the writers during the summer of 1900, under the auspices of the Hopkins Seaside Laboratory of Stanford University, although several specimens were obtained by the U. S. Fish Commission steamer *Albatross*. Series of types are in the museum of Stanford University and in the United States National Museum. The illustrative drawings are the work of Mr. A. H. Baldwin and Chloe Lesley Starks.

The group Trachinoidea comprises a series of transitional forms, showing affinities with the Percoidea on the one hand and with the Batrachoididæ and Blennioidea on the other. In general, the spinous dorsal is short or weak, the soft dorsal long and similar to the anal, the ventral jugular and the squamation is less complete and less ctenoid than in the Percoidea. The skull is, in general, depressed, with the supraocular crest low, and the suborbital stay is wanting, although in some genera the suborbital bones are enlarged. The bones of the skull are not strongly armed, and the ventral fins always inserted well forward, and they are sometimes reduced in size.

According to recent studies of Dr. Boulenger,¹ the Trachinidæ proper have the hypercoracoid imperforate, as in the Gadidæ. Their general relationship with the cod-fishes and blennies is such that Boulenger proposes to revive the suborder Jugulares to include not only the Gadoid fishes, but the Ophidioid, Blennioid, and Trachinoid forms also, in fact, all fishes having truly jugular ventrals. Several families hitherto called Trachinoid, but which possess thoracic ventrals, should be widely dissociated. In most cases their real place is not far from the Percoid forms. In the present paper these families are considered as well as the genuine Trachinoids.

¹Ann. Mag. Nat. Hist., 7th ser., VIII, 1901, pp. 261-271.

ANALYSIS OF FAMILIES.

- I. TRACHINOIDEA. Ventral fins jugular placed in advance of the pectorals; pectoral fin supported by the hypercoracoid and by short broad pterygials; no air bladder.
- b. Hypercoracoid ("scapula") not pierced by a foramen, the foramen or fenestra lying on its lower edge adjoining the hypocoracoid, as in the *Gadidæ*.
- c. Subocular lamina wanting NOTOTHENIIDÆ, 1.
- bb. Hypercoracoid pierced by a foramen, as usual among fishes.
- d. Pterygials separate, well developed, top of head not bony. LEPTOSCOPIDÆ, 2.
- dd. Pterygials much reduced, fused with the coracoids; gills $3\frac{1}{2}$, suborbitals dilated; top of head bony; physiognomy peculiar, the eyes superior, and the mouth almost vertical URANOSCOPIDÆ, 3.
- II. NON-TRACHINOID FORMS: Ventral fins thoracic, normally formed; pectoral fin supported on both coracoids, with well-developed pterygials; air bladder usually developed.
- e. Ventrals subabdominal, although inserted well forward, the pelvis connected to the pelvic arch by a ligament; body with rough scales; lateral lines two, with cross series of pores; mouth with movable canines (allied to *Chiasmodontidæ*) CHAMPSODONTIDÆ, 4.
- ee. Ventrals normally thoracic.
- f. Body naked; vertebrae numerous (51); pectoral broad, its lower rays thickened (allied to *Latrididæ*) TRICHODONTIDÆ, 5.
- ff. Body scaly.
- g. Muciferous system of head largely developed; mouth small, with small teeth (allied to *Sciænidæ*) SILLAGINIDÆ, 6.
- gg. Muciferous system little developed; subocular lamina developed.
- h. Lateral line single, complete; scales small; body compressed. LATILIDÆ, 7.
- hh. Lateral line incomplete, sometimes duplicated; premaxillary without posterior canine (allied to *Serranidæ*).
- i. Lateral line interrupted, beginning again lower on the tail. Maxillary not dilated; scales ctenoid... PSEUDOCROMIDIDÆ, 8.
- ii. Lateral line with the dorsal portion only developed; maxillary dilated behind; scales cycloid... OPISTHOGNATHIDÆ, 9.

Family I. NOTOTHENIIDÆ.

Body oblong or elongate, naked or covered with rather small, firm ctenoid scales; lateral line various, sometimes double or triple; mouth moderate or large, nearly horizontal, the teeth moderate; eyes lateral or directed somewhat upward; preopercle entire, or nearly so; opercle usually with a spine; gill membranes separated or united, sometimes joined to the isthmus; branchiostegals 6 or 7; pseudo-branchiæ present; dorsal fin long, usually continuous, its anterior part with 4 to 10 spines; anal similar to soft dorsal; caudal usually not forked; pectorals broad, but two of the short broad pterygials resting on the hypercoracoid which is not pierced by a foramen, the foramen being on its lower margin; second suborbital not produced in an internal lamina; ribs and epipleurals nearly equally developed and sessile close together at base; posterior precaudal vertebrae emitting short parapophyses (Boulenger), normally placed; ventrals jugular, placed in advance of

them, well separated, a rhombic area between them, the rays I, 5; no air bladder; pyloric cæca few; vertebrae typically 10 + 20. Small fishes of the tropical and antarctic seas, often brightly colored.

- a. Gill membranes united, free from the isthmus; body scaly; lateral line single.
b. Palatines without teeth; dorsal notched, its middle spines highest. *Parapercis*, 1
bb. Palatines with teeth; last spines of dorsal highest *Neopercis*, 2

1. PARAPERCS Bleeker.

Percis SCHNEIDER, Syst. Ichthyol., 1801, p. 179 (*maculatus*); (not of Scopoli; a genus of Agonidæ, 1777).

Parapercis BLEEKER, Fauna Ichth. Chine, Ned. Tydskr, Dierk., IV, 1872, p. 127 (*cylindrica*).

Body cylindrical, rather elongate; mouth moderate, slightly oblique, the jaws equal; teeth villiform, with small canines; no teeth on the palatines; dorsal divided, the middle spines highest. Lateral line single curved upward anteriorly; body with ctenoid scales, gill membranes free from the isthmus.

(*παρά*, near; *Percis*, a name transferred from this genus to another to which it was earlier applied, allied to *πέρκη*, perch.)

- a. Body and tail without distinct black, white edged ocelli; a broad dark lateral band; lower parts of head with dark cross bars. D. V, 21; scales, 62 *pulchella*, 1
aa. Body with single large ocellus at upper base of caudal fin; lower parts of head without distinct bands. D. V, 22; scales, 58 *ommatura*, 2
aaa. Body with three or more ocelli on the lower parts; caudal with a black central blotch. D. V, 19; scales, 62 *hexophthalma*, 3

I. PARAPERCS PULCHELLA (Schlegel).

TOGORO¹—IWASHI (JACK-SARDINE).

Percis pulchella SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 24, pl. x, fig. 2; Nagasaki.—RICHARDSON, Ichth. China, 1846, p. 211; Canton.—GÜNTHER, Cat. Fish., II, 1870, p. 240; Nagasaki.—STEINDACHNER und DÖDERLEIN, Fische Japans, III, 1884, p. 190; Tokyo Bay.—NYSTROM, Svensk. Vet. Akad., 1887, p. 28; Nagasaki.

Head, 4 in length; depth, 5½; depth of caudal peduncle, 2½ in head; eye, 4½; snout, 2½; interorbital space, 7; pectoral, 5½ in length; ventral, 5½; caudal (upper rays), 4½; D. V—21; A, 18; scales in lateral line, 62; in transverse series, 24; between lateral line and insertion of dorsal, 5.

Body elongate, subcylindrical, the caudal peduncle somewhat compressed, dorsal contour of head rising rapidly from tip of snout to interorbital space; snout short; eyes high in head, nearer to tip of snout than to posterior edge of opercle, a distance about equal to diameter of pupil, directed obliquely upward; interorbital space narrow, flat. Mouth large, oblique, lips broad, premaxillary very protractile, the maxillary entirely concealed beneath the preorbital, extending posteriorly to a vertical through anterior edge of pupil. Teeth on the

¹ Togoro is a familiar boy's name, corresponding to Jack or Charley.

jaws in 2 series, an outer row of enlarged, simple teeth, and an inner band of minute, close-set ones; a patch of small teeth on vomer. Gill-membranes forming a fold across the isthmus. Gillrakers on first arch 3 + 8, short and flat.

Upper parts of body with finely ctenoid scales, which grow smooth in the region behind occiput at base of pectoral and on the breast and belly; sides of head with small cycloid-scales; interorbital space, snout, and jaws smooth.

Dorsals continuous, the spinous dorsal inserted above base of pectoral. Rays of soft dorsal and anal with free tips; rays of upper part of caudal elongate, projecting beyond edge of fin. Pectorals rounded posteriorly, the ventrals pointed.

Color in spirits yellowish brown, upper parts of body and a median lateral band dusky, each scale in the dusky areas with a small brownish spot; head with dark bands across the occiput, cheeks, and suborbital region; chin and throat with blackish spots; dorsal, anal, and caudal with pearly spots bounded by dark color.

Color in life: Body with a broad bluish white lateral band interrupted by small reddish spots; above the band, reddish olive with blue spots; below the white band is a parallel, reddish band, rather indefinite in outline, about $1\frac{1}{2}$ times as wide as the former; below this band the body is of a dark-pinkish hue, each scale with a central reddish spot; occipital part of head orange yellow with a broad, bluish transverse blotch bordered by black which shades off into purple, the latter color extending backward on the body; interorbital space yellowish lilac, the yellow strongest on band between eyes; a broad yellowish band extending from eye toward maxillary; upper part of eye reddish; cheeks brownish, becoming blackish anteriorly; sides of head and upper part of snout with narrow bands of indigo blue; throat white with brownish black markings; membrane of spinous dorsal bluish white, the spines blackish, the dark color spreading to the membrane anterior to each spine, upper part of fin narrowly bordered with white; below the border is a narrow band of brownish black which shades into orange on its lower side. Soft dorsal with yellowish olive spots, the upper parts of rays tipped with orange; membrane of upper part of caudal with alternating spots of orange and of pearly white, lower part brick red with indistinct white spots; basal part of anal yellowish orange with white spots, which are bordered with blue; outer part of fin with bright bands, the colors of which blend on the margins, the outer band white, then brownish black, red, white, and again red; pectoral with a brownish spot at lower part of base; above spot, bluish with reddish reticulations, the fin suffused with pinkish shading into brick red on the margin. Lower part of ventral suffused with red, clouded with darker shades, the upper part blackish; inner ray with a line of light brick red.

Coasts of southern Japan, abundant about Nagasaki, rare northward; a showy little fish reaching a length of about 200 millimeters; our many specimens from Wakanoura and Nagasaki.

(*Pulchellus*, pretty.)

2. *PARAPERCIS OMMATURA* Jordan and Snyder, new species.

Head, 4 in length; depth, $5\frac{1}{4}$; depth of caudal peduncle, 3 in head; eye, $3\frac{3}{8}$, snout, $3\frac{3}{8}$, interorbital space, 12; pectoral, $5\frac{1}{2}$ in length; ventral, 5; caudal, 6; D-V, 22; A., 19; scales in lateral line, 58; in transverse series 16; between lateral line and insertion of dorsal 4.

Body elongate, almost cylindrical, more compressed on caudal peduncle, the head long and pointed. Eye large, the diameter equal to length of snout, located high up, the upper margin projecting above head; interorbital space very narrow, concave; mouth moderate, oblique, the lower jaw projecting; upper lip broad, the premaxillary protractile; maxillary entirely concealed by preorbital, reaching a vertical through anterior edge of orbit. Teeth in 2 series on the jaws,

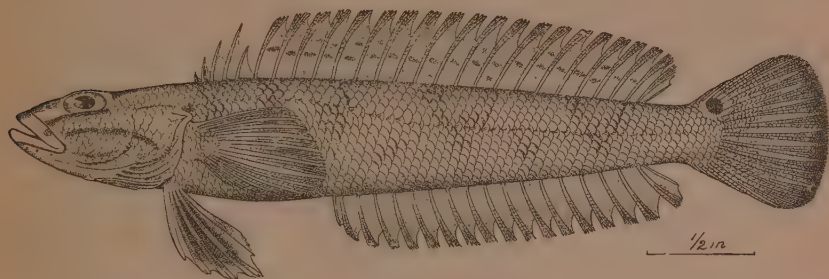


FIG. 1.—*PARAPERCIS OMMATURA*.

an outer row of enlarged, slightly curved, canine-like teeth, and an inner, narrow band of minute ones; a small patch of fine teeth on the vomer. Gill-membranes forming a narrow fold across the isthmus; gillrakers on first arch about 3 + 10 short, those near ends of arch represented by slight elevations. Preopercle with 6 or 7 small spines on the angular portion of the edge; opercle with a strong spine at posterior angle; about 11 small spines on the lower edge.

Body covered with ctenoid scales, the denticulations somewhat weaker on the anterior and ventral parts; occiput and sides of head with ctenoid scales; interorbital space and snout naked. Very small scales extending on basal half of caudal.

Dorsal separate or only slightly joined at their bases, the fourth spine highest and strongest, about one-third of its length longer than diameter of eye, the third spine of about equal length; rays higher than the spines, the anterior ones about equal to distance from tip of snout to posterior border of pupil. Anal inserted below the fifth dorsal ray; dorsal and anal extending an equal distance posteriorly,

neither when depressed quite reaching base of caudal; caudal rounded posteriorly; pectoral acutely rounded; ventral pointed.

Color, in alcohol, pale, brownish yellow, with a few indistinct, dusky, V-shaped marks and elongate spots on sides; two narrow longitudinal dark bands on cheeks; soft dorsal with 2 or 3 rows of elongate black spots on the membranes; anal dusky near the margin; upper basal part of caudal with a round black spot about the size of pupil, surrounded by a narrow ring of lighter color; pectoral without dark color, except a very narrow dusky margin; middle part of ventrals dark gray, becoming inky black toward end of fin, the dark color bordered by dead white.

In some specimens the markings on sides of body are more distinct, being semicircular, or more often Y-shaped. Occasionally the whole upper part of the body is dusky.

The prominent caudal spot serves at once to distinguish the species from *P. pulchella*. The latter species also reaches a much larger size.

Type.—No. 6540, Leland Stanford Junior University Museum, from Nagasaki.

A prettily colored little fish, common in the bays about Nagasaki and in the Inland Sea. Our many specimens were taken at Nagasaki, Tsuruga, and Kobe. The largest is about 120 millimeters long.

(ὄμμα, eye; σῦρα, tail.)

3. PARAPERCIS HEXOPHTHALMA (Ehrenberg).

Percis hexophthalma (Ehrenberg) CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 1829, p. 271; Massuah, Red Sea; Hist. Nat. Poiss., VII, p. 507; Seychelles.—GÜNTHER, Cat. Fish., II, 1860, p. 239; Red Sea, Louisiades.—ISHIKAWA, Prel. Cat., 1897, p. 46; Riukiu Islands.

? *Percis polyophthalmia* CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 1829, p. 272; Massuah.

Percis caudimaculata RÜPPEL, Neue Wirbelthiere, Fische, 1824, p. 98; Red Sea.—BLEEKER, Perc., p. 54; Celebes, IV, p. 11; Celebes.

Head $4\frac{1}{2}$ (with caudal); depth 7; D. V.—19; A. 18; scales 7–62–19; interorbital space 3 in snout; ventrals about reaching front of anal; caudal with a black central blotch; along each side of belly three or more white rings with black centers; spinous dorsal with a black basal spot; soft dorsal with three lengthwise series of black spots; anal with one. (*Günther*.) East Indies, a specimen from the Riukiu Islands in the Imperial Museum of Japan; not seen by us.

(ἕξ, six; ὀφθαλμος, eye.)

2. NEOPERCIS Steindachner.

Parapercis STEINDACHNER, Ichth. Beitr., XIII, 1883, p. 1072 (*ramsayi*), (not of Bleeker).

Neopercis STEINDACHNER, Fische Japans, III, 1884, p. 212 (*ramsayi*).

Palatines with teeth; dorsal scarcely notched, the middle spines not

longer than the posterior ones. Dorsal rays V, 23; A. 20; scales about 60. Otherwise essentially as in *Parapercis*.

(*νέος*, new; *Percis*.)

a. Color golden or red with blackish cross bands.

b. Cross bands in 3 or 4 pairs; a black ocellus at upper base of caudal.

sexfasciata, 4

bb. Cross bands narrower and more numerous, about 6 broad ones, each with a narrow one before and behind it; a round black blotch (not ocellus) at upper base of caudal

multifasciata, 5

aa. Color golden red with broad cross shades of orange; no black bars or spots.

aurantiaca, 6

4. NEOPERCIS SEXFASCIATA (Schlegel).

TORA-GISU (TIGER KISUGO¹), TORA-HAZE (TIGER-GOBY).

Percis sexfasciata SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 25; Nagasaki.—GÜNTHER, Cat. Fish., II, 1870, p. 241 (copied).—NYSTROM, Svensk. Vet. Akad., 1887, p. 28; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 46; Katsura, Sagami, Wakanoura, Kagoshima.

Parapercis sexfasciatus STEINDACHNER and DÖDERLEIN, Fische Japans, III, 1884, p. 22; Tokyo.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 369; Tokyo.

Head, $3\frac{2}{5}$ in length; depth $5\frac{1}{2}$; depth of caudal peduncle $3\frac{1}{2}$ in head; eye $3\frac{1}{2}$; snout $3\frac{1}{2}$; interorbital space $1\frac{1}{2}$; pectoral $5\frac{1}{2}$ in length; ventral $5\frac{1}{2}$; caudal $5\frac{2}{3}$; D. V, 23; A, 19; scales in lateral line 60; in transverse series 24; between lateral line and insertion of dorsal 5.

Body elongate, subcylindrical, compressed on caudal peduncle; eye high in head, directed obliquely upward; interorbital space narrow, concave; snout pointed, its length equal to diameter of eye; mouth oblique, lower jaw slightly projecting, lips broad; maxillary concealed, extending posteriorly to a vertical through anterior edge of orbit; jaws with an outer row of enlarged teeth and an inner band of very small ones; vomer and palatines with small, close-set teeth; gillrakers very small, 5 + 11 on first arch; opercle with a weak spine on upper posterior edge; edges of opercle and preopercle without denticulations.

Scales of body, occiput, and sides of head, ctenoid.

Dorsal fins continuous; fifth dorsal spine longest, about equal to length of snout; length of highest rays about 2 in head. Anal inserted below base of fifth dorsal ray, similar in shape to the soft dorsal, both fins, when depressed, extending to base of caudal; pectorals rounded posteriorly; ventrals pointed, color, red in life; sides with 4 conspicuous V-shaped, dusky marks, the color extending on base of dorsal fin; a dark band extending from base of pectoral over nape, a dark spot on cheek, another on base of pectoral, an ocellated blotch on upper part of base of caudal; membranes of dorsal with dusky clouds; anal bordered with dusky; caudal with 3 or 4 dark vertical bands, which are

¹ Kisugo or Gisu is the name of several slim-headed fishes allied to *Sillago* or to *Pterothrissus*.

conspicuous on the upper edge; ventrals dusky; pectorals without dark color except at base.

Coasts of Japan, very common in sandy bays from Tokyo southward. Our many specimens from Tokyo, Awa, Misaki, Onomichi, Kobe, Wakanoura, Tsuruga, Suruga Bay, Sagami Bay, Owari Bay, and Nagasaki.

(*See*, six; *fasciata*, band.)

5. NEOPERCIS MULTIFASCIATA (Döderlein).

OKIGISU (OFF SHORE KISUGO); AKATORA-HAZE (RED TIGER-GOBY).

Parapercis multifasciata DÖDERLEIN, Fische Japans., III, 1884, p. 190, pl. vi, figs. 2, 2a; Bay of Tokyo.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 369; Tokyo.

Percis multifasciata NYSTROM, Svensk. Vet. Ak., 1887, p. 28; Nagasaki.

Head $3\frac{3}{4}$ in length, depth $4\frac{3}{4}$; depth of caudal peduncle $2\frac{3}{8}$ in head; eye $3\frac{1}{2}$; snout 3; interorbital space 8; pectoral $4\frac{2}{3}$ in length; ventral $4\frac{5}{8}$; caudal $5\frac{1}{2}$; D. V, 23; A. 20; scales in lateral line 60; in transverse series 25; between lateral line and insertion of dorsal 5.

In shape, this species resembles *N. serfasciata*. Quickly recognized differences are the steeper anterior profile, the projecting lower jaw, and the deeper caudal peduncle.

The species differ widely in color. In *N. multifasciata* there are 6 broad, dusky, vertical bands on upper half of body, each band bordered before and behind by a narrow bar of dark brown, the border of the posterior band forming a large round blotch on upper half of base of caudal. Upper half of caudal and posterior part of soft dorsal with narrow, dusky, vertical bars, the other fins plain. In large specimens the central, dusky color of the vertical bands of body becomes very indistinct, the dark borders remaining prominent. Both species are red or brownish red in life.

Coast of Japan from Tokyo to Nagasaki. The specimens described were taken in Tokyo Bay. Others were dredged in Owari Bay, in Sagami Bay off Enoshima and in Suruga Bay off Enoura, by the U. S. Fish Commission steamer *Albatross*.

(*Multus*, many; *fasciatus*, banded.)

6. NEOPERCIS AURANTIACA (Döderlein).

AKA-GISU (RED KISUGO).

Parapercis aurantiaca DÖDERLEIN, Fische Japans., III, 1884, p. 191, pl. iii, figs. 2, 2a; Tokyo.

Head $4\frac{2}{3}$ in total length; depth $6\frac{1}{2}$ to $7\frac{1}{3}$; eye 3 to $3\frac{1}{4}$ in head; D. V—23; A. 21; scales in lateral line 57 to 60.

Snout somewhat shorter than diameter of eye; lower jaw slightly projecting; maxillary extending to a vertical through anterior part of pupil. Opercle with a single, sharp spine. Dorsals continuous,

the third and fourth spines highest, the first about one-half as long as the second, rays about $1\frac{5}{8}$ in head, anal rays about $2\frac{3}{8}$ in head. Pectoral reaching to insertion of anal, its posterior edge acutely rounded. Ventral about $1\frac{3}{8}$ in head. Caudal bluntly rounded; cheeks and opercle with scales; bases of pectoral and caudal scaled.

Golden red, with 5 broad orange-yellow bands on body; head yellow and red; fins yellow; posterior part of dorsal with about 3 narrow, oblique, purple bands; caudal with 5 vertical bands (Döderlein.)

About Tokyo, in rather deep water, taken in the winter. Not seen by us.

(*Aurantiacus*, orange-colored.)

FAMILY II. LEPTOSCOPIDÆ.

As defined by Boulenger this family differs from *Nototheniidae* in having the hypercoracoid pierced by a foramen. From the *Percoptidae* it differs in the absence of subocular lamina. The skeleton of *Pteropsaron*¹ has not been examined, but it is doubtless an ally of *Bembrops*. According to Boulenger the *Callionymidae* are also related to the *Leptoscopidae*.

a. Body with large, scarcely ctenoid scales; dorsal fins separate; gill membranes nearly separate, free from isthmus.

b. Maxillary with a fleshy flap at its tip; preopercle with two small spines at its angle; opercle with two spines *Bembrops*, 3.

bb. Maxillary without flap; preopercle entire; opercle with one distinct spine.

Pteropsaron, 4.

3. BEMBROPS Steindachner.

Bembrops STEINDACHNER, Sitzgber. Wien, LXXIV, I, p. 211 (Ichth. Beitr., V, 1876, p. 163, (*caudimacula*).

Hysicometes GOODE, Proc. U. S. Nat. Mus., III, 1880, p. 347 (*gobioides*).

*Bathypercis*² ALCOCK, Journ. Asiatic Soc. Bengal, LXII, 1893, pp. 2, 177 (*platyrhynchus*).

Head strongly depressed, the snout spatulate. Mouth long, subhorizontal. Teeth in jaws and on vomer and palatines; maxillary with a fleshy flap or barbel at tip. Eyes very large, half lateral. Opercle with two spines; angle of preopercle with two small spines, at least in Japanese species; preorbital entire; gill opening very long, with 7 branchiostegals; Pseudobranchiæ present. Ventrals jugular. Dorsal fins 2, well separated. Belly flattened, back convex. Scales rather large, finely ctenoid.

Small fishes inhabiting depths in Asia and America.

¹ The skeleton of *Pteropsaron evolans* has, since writing this, been examined by Mr. Starks and the writer. It has the hypercoracoid with the foramen on its very lower edge, but with a ring of bone around it exactly as in *Parapercis*. It should be placed with probably *Bembrops*, also in the same family with *Neopercis* and *Parapercis*.

² According to Dr. Alcock. *Bathypercis platyrhynchus* of the Indian Ocean is identical with *Hysicometes gobioides* of the Atlantic, and both belong to the genus *Bembrops*. *Hysicometes gobioides* is figured as having the preopercle entire.

7. BEMBROPS CAUDIMACULA Steindachner.

Bembrops caudimacula STEINDACHNER, Ichth. Beitr., V, 1876, p. 163; Nagasaki.

Head $2\frac{3}{5}$; D. VI-14; A. 16; V. I, 5; P. 23; scales 42; breadth of head $2\frac{3}{5}$ in its length; snout $3\frac{2}{5}$; eye $4\frac{1}{2}$; lower jaw projecting; inter-orbital very narrow, its width 6 in eye; mouth long, $2\frac{2}{5}$ in head; maxillary with a rather long flap or filament at its tip, which is just before anterior margin of eye; tongue spoon-shaped; snout scaleless; subopercle forming a compressed spine ending in a sharp point. Spinous dorsal slender, its height a little less than 3 in head; longest soft ray $2\frac{2}{5}$ in head; base of second dorsal 3 in head, a little shorter than anal; ventrals inserted well before pectorals and a little shorter than the latter, which are not quite half head; caudal weakly convex; lateral line complete, running low.

Color yellowish brown above, paler below: scales edged with darker; sides with diffuse brownish shades along lateral line; membranes of first dorsal black; caudal clear brownish yellow spotted with brown, an oval blackish spot just behind its base in the upper half, reaching to its posterior margin (Steindachner).

Japan. Known from one specimen $5\frac{1}{2}$ inches long from Nagasaki. (*Cauda*, tail; *macula*, spot.)

4. PTEROPSARON Jordan and Snyder, new genus.

Pteropsaron JORDAN and SNYDER, new genus (*evolans*).

Body subcylindrical, depressed anteriorly, covered with large cycloid scales; lateral line continuous; head depressed, flattened anteriorly, the snout produced, broadly spatulate; mouth large, the jaws subequal; maxillary without barbel; teeth small, on jaws, the vomer and palatines smooth; eyes very large, largely vertical in range, separated by a very narrow ridge; suborbital very narrow; cheeks and opercles scaly; preopercle rounded, entire, but with mucous tubes near its edge; opercle with a partly concealed spine before its membranous tip; gill rakers obsolete; gill membranes separate, free from the isthmus. Dorsal fins separate, the first short, but sometimes greatly elevated; second similar to anal; caudal convex; ventrals I, 5, well separated, a rhombic area before them, inserted before pectorals, the inner rays longest, pectorals normal. Lateral line simple median.

This genus is allied to *Bembrops*, from which it differs in the absence of a fleshy flap on the maxillary.

(*πτέρων*, wing; *ψαρόν*, a little fish in modern Greek.)

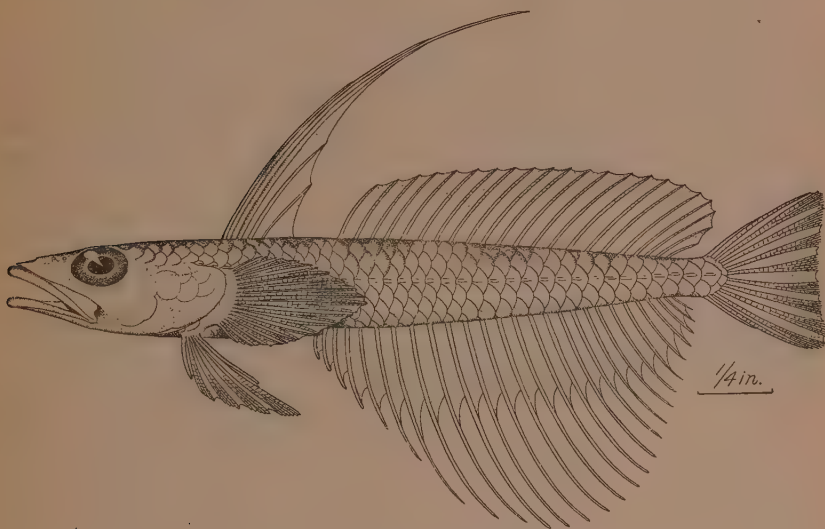
a. Dorsal spines 6; anal rays 27, the first dorsal and anal greatly elevated....*evolans*, 8.

aa. Dorsal spines 4; anal rays 22, the first dorsal and anal low*verecundum*, 9.

8. *PTEROPSARON EVOLANS* Jordan and Snyder, new species.

Head $3\frac{1}{8}$ in length, depth $7\frac{1}{2}$; depth of caudal peduncle $4\frac{3}{4}$ in head; eye $3\frac{1}{8}$; snout $3\frac{1}{8}$; interorbital space about 17; pectoral 5 in length; ventral $5\frac{1}{4}$; caudal $5\frac{1}{4}$; D. VI, I, 21; A. 27; scales in lateral line 32; in transverse series 8; between lateral line and insertion of spinous dorsal 2.

Body elongate, cylindrical, the caudal peduncle compressed; head long, pointed. Eye very large, high in head, directed obliquely upward; interorbital space very narrow, flat. Snout pointed, somewhat spatulate, slightly longer than diameter of eye. Upper jaw projecting. Mouth large, the cleft oblique, premaxillary protractile,

FIG. 2.—*PTEROPSARON EVOLANS*,

maxillary extending posteriorly to center of pupil. Teeth slender, sharp, in narrow bands on both jaws; no canines; no vomerine or palatine teeth. Gill-rakers on first arch $0+9$, short, blunt, with minute setæ. Opercle with a weak, flat, concealed spine, preopercle entire.

Body covered with large, smooth scales; occiput with scales, opercle with 4 or 5 large, very thin scales, head otherwise naked. Lateral line straight.

Dorsals widely separated, the first very long and falcate, its height a little less than twice the length of head, the first 4 spines longest, the others much shorter; soft dorsal much lower, the highest rays contained about two times in head. Anal fin inserted a little anterior to insertion of soft dorsal; the first and last rays short, the middle ones greatly developed, their height a little more than length of head, the distal half of the longer rays extending beyond the membranes,

the free part becoming less as the rays grow shorter. When depressed, the rays of the dorsal extend a little farther posteriorly than do those of the anal, just reaching base of caudal. Posterior margin of caudal slightly convex. Pectorals and ventrals pointed.

Back with 5 indistinct, broad, dusky cross-bars; spinous dorsal with a dusky spot, other fins plain, the dorsal and anal dead white.

Type No. 50008, U. S. National Museum. Sagami Bay, dredged in about 60 fathoms by the U. S. Fish Commission steamer *Albatross*. Three other specimens similar in size and character were taken in Owari Bay.

(*Evolans*, flying away, from the high fins.)

9. *PTEROPSARON VERECUNDUM* Jordan and Snyder, new species.

Head $3\frac{1}{10}$ in length; depth $7\frac{1}{5}$; depth of caudal peduncle 6 in head; eye $3\frac{1}{2}$; snout $3\frac{1}{5}$; pectoral $5\frac{1}{5}$ in length; ventral $4\frac{1}{2}$; caudal $5\frac{4}{5}$; D. Iv., I-17 or more; A. 22; scales in lateral line 30; in transverse series 6; between lateral line and insertion of spinous dorsal 2.

Body elongate, cylindrical. Head very long, snout sharp, somewhat spatulate, the lower jaw included. Eye large, its diameter slightly greater than length of snout, the upper edge projecting above

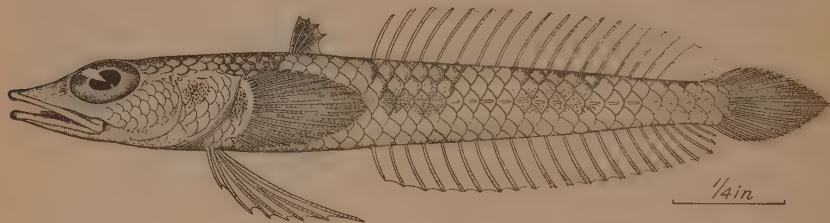


FIG. 3.—*PTEROPSARON VERECUNDUM*.

contour of head, the interorbital space a mere line between the eyes. Mouth large, the cleft somewhat oblique. Premaxillary very protractile, maxillary extending to a perpendicular through center of pupil. Teeth simple, in narrow bands of two or three rows on both jaws; no canines; no teeth on vomer or palatines. Gill-rakers on first are very small or absent. Opercle with a weak, flat spine, preopercle without spines, the edges smooth.

Body with large, smooth scales; cheeks, opercles, and occiput with thin, smooth scales. Lateral line straight, except at anterior part, where it is somewhat bent upward.

Dorsal fins well separated, the distance between them contained about $4\frac{1}{2}$ times in length of head; the spines of about equal length, the fourth a little shorter than the first, which is contained about 6 times in length of head; the rays higher than the spines, the longest contained about $3\frac{1}{2}$ times in head. Anal inserted directly below insertion of dorsal; the rays about as high as those of dorsal; pectorals and ventrals pointed.

Upper parts with 4 broad, dusky cross-bands, extending over the back and downward to the lateral line, the anterior band on nape, the posterior one on caudal peduncle; dorsal fin very dark; upper half of iris blue black.

The dorsal and caudal fins are injured, making a correct description of their outline impossible; the first dorsal is very low. Perhaps older or larger specimens might show vomerine or palatine teeth.

The type is numbered 50009, U. S. National Museum; collected in Suruga Bay, Japan, by the U. S. Fish Commission steamer *Albatross*. No other specimens were taken.

(*Verecundus*, modest.)

Family III. URANOSCOPIDÆ.

THE STAR-GAZERS.

Head large, broad, partly covered with bony plates. Body elongate, conic, subcompressed, widest and usually deepest at the occiput. Body either naked or covered with very small, smooth, adherent scales, which are arranged in very oblique series running downward and backward; the scales on the belly inconspicuous or obsolete. Lateral line little developed, running high. Eyes small, on anterior and upper portion of head, with vertical rings. Mouth vertical, with strong and prominent mandible; teeth moderate, on jaws, vomer, and palatines. Premaxillaries freely protractile; maxillary broad, without supplemental bones, not slipping under the preorbital. Gill openings wide, continued forward; gill membranes nearly separate, free from isthmus. Pseudobranchiæ present; 6 branchiostegals; $3\frac{1}{2}$ gills, a slit behind the last; no anal papilla. Spinous dorsal very short or wanting; second dorsal long. Anal and pectorals large, the latter with broad oblique bases, the lower rays rapidly shortened, most of them branched; ventrals jugular, close together, I. 5, the spine very short, innermost ray longest; caudal not forked. Pterygials, according to Boulenger much reduced, fused with the hypercoracoid and hypocoracoid, hyperacoid with a foramen or fenestra; parapophyses strongly developed on most of the precaudal vertebræ, the ribs attached to their upper surface. Air bladder absent; pyloric cæca in moderate number. Vertebræ 24 to 26. Carnivorous fishes, living on the bottom of the shores of most warm regions.

a. Uranoscopinae. Spinous dorsal separate from soft dorsal of 4 or 5 pungent species; scales present; very small fringes on opercle; no fringed humeral appendage; scapular spine long; lips and nostrils fringed; mouth with a retractile filament; top of head almost entirely bony, the occipital plate extending forward to the orbits..... *Uranoscopus*, 5.

aa. Spinous dorsal not forming a separate fin.

b. Ichthyoscopinae. Humeral region with a fringed appendage; opercle conspicuously fringed; body scaly; chin without appendages; no barbel *Ichthyoscopus*, 6.

- bb. *Gnathagninae*. Humeral region without fringed appendage; opercle not fringed; chin with saber-shaped dilatations of the rami of the mandible; no barbels.
- c. Body scaly; preopercle without prominence at the angle; dilatations of lower jaw sharp at upper end *Gnathagnus*, 7.
- cc. Body naked; preopercle with a blunt prominence; dilatations of lower jaw without sharp point *Ariscopius*, 8.

3. URANOSCOPUS Linnæus.

Uranoscopus LINNÆUS, Syst. Nat., 10th ed., 1758 p. 250 (*scaber*).

This genus includes those *Uranoscopidae* which have the head largely bony above, the body scaly, the spinous dorsal developed, a humeral spine developed, and a retractile filament in the mouth below the tongue.

(οὐρανός, heaven; σκοπός, looking.)

- a. Scales large, about 36 in lateral series; head and trunk with rosy spots above; preopercle with 4 spines *oligolepis*, 10.
- aa. Scales rather small, 55 to 65 in the lateral line; spinous dorsal black.
- b. Scales 64; head moderate; ground color of body forming brownish reticulations around whitish spots *japonicus*, 11.
- bb. Scales 56; head very broad; body more robust; ground color forming about two dark brown cross shades or broad bands *bicinctus*, 12.

10. URANOSCOPUS OLIGOLEPIS Bleeker.

Uranoscopus scaber RICHARDSON, Ichth. China, 1846, p. 211; Canton (not of Linnæus).

Uranoscopus asper SCHLEGEL, Verh. Bat. Gen., XXV, Japan, p. 27; Nagasaki (not of Schlegel).

Uranoscopus oligolepis BLEEKER, Atlas Ichth., p. 425, Trig., pl. v., fig. 7; Sumatra, Amboina, Nagasaki.

Head 3; depth $3\frac{2}{3}$; D. V.—13 or 14; A. 13 or 14; P. 16; scales 38.

Body rather elongate, broader than deep anteriorly; eye 5 to 6 in head, nearly as wide as interorbital space, no cirri at the chin; preopercle with 4 rough radiating spines; opercle granose; suprascapular spine oblique; upper humeral spine sulcate, twice diameter of eye, directed toward the middle of the spinous dorsal; dorsal fins near together, the soft rays much higher; caudal truncate-convex, not longer than head without snout. Color brownish rosy above, pearly or rosy below, no dark spots or cross bands; fringes dusky; head and trunk above with irregular yellowish or rosy spots; spinous dorsal black, yellowish at tip; soft dorsal dusky, with darker shades; anal with a median pearly line.

East Indies, Amboina, Straits of Sunda. One specimen in Bleeker's collection said to have come from Japan.

According to Bleeker the species differs from *Uranoscopus japonicus* (*asper*) not only in its scales, but also in the proportions of the height of the body, the length and breadth of the head, the number of preopercular spines, and the length and direction of the upper humeral spine.

(ὀλίγός, few; λεπτός, scale).

II. URANOSCOPUS JAPONICUS Houttuyn.

TEMONDAI-OKOSE (OBSERVATORY SCULPIN).

Uranoscopus japonicus HOUTTUYN, Holl. Maats. Wet. Harlem, 1782, p. 311; Nagasaki.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 745.

Uranoscopus asper SCHLEGEL, Fauna Japonica, 1846, p. 26, pl. ix, fig. 1; Nagasaki.—RICHARDSON, Ichth. China, 1846, p. 211.—GÜNTHER, Cat. Fish., II, 1860, p. 228; Japan.—NYSTROM, Svensk. Vet. Akad., 1887, p. 28; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 46; Tokio, Kii.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 369; Tokio.

Head $3\frac{1}{5}$ in length; depth, $4\frac{1}{5}$; depth of caudal peduncle, $2\frac{4}{5}$ in head; eye, $5\frac{1}{3}$; interorbital space, 5; snout, 7; D. IV-14; A. 13; scales in lateral series 64.

Body robust, fusiform, compressed at caudal peduncle; head flat above, snout very short, mouth vertical; length of maxillary contained $2\frac{1}{10}$ times in head; teeth small, in a narrow band on upper jaw, in two rows on lower jaw, in villiform bands on vomer, palatines, and pharyngeals. Eyes small, located on upper side of head, directed obliquely upward. Gill rakers on first arch obsolete, represented by a few small bunches of setæ. Top and sides of head with moderately rugose bony plates; the dorsal plate extending forward between the eyes where it is divided by a deep depression; the preorbital plate with a blunt spine; preopercle with 3 blunt spines on lower edge, humeral spine of varying length, about 3 in head, a small blunt spine above the latter. Gill membrane with a fringe.

Scales small, square, deeply embedded; arranged in about 64 oblique rows; occiput, a narrow strip along base of dorsal, breast, belly, and a narrow area along anal fin, naked; lateral line extending along base of dorsal fin.

Dorsals separate, the spines very slender, the highest about 4 in head; anterior rays highest, 2 in head. Anal inserted below first ray of dorsal, the fin-membrane and especially the branched portion of the rays fleshy; caudal convex posteriorly; middle rays of pectoral longest; ventrals about $1\frac{1}{2}$ in head; a strong spine projecting forward from each side of base of fin.

Color in alcohol, yellowish white, the sides and upper parts brownish; on the dorsal parts of the head and body the brown color occurs in reticulations which map out whitish spots and rings of very irregular outline, those in the head much smaller than those in the body; spinous dorsal black; soft dorsal with small dusky spots along the rays; caudal and pectoral dusky, narrowly edged with white; anal with a little dusky color.

Coasts of Japan, generally common southward, here described from a specimen 250 millimeters long from Yokohama. We have many other examples from Wakanoura. It was also seen at Hakata, Misaki, and Tokyo.

12. URANOSCOPUS BICINCTUS Schlegel.

MEGANE-UWO (SPECTACLE FISH).

Uranoscopus bicinctus SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 26, pl. x B; Nagasaki.—BLEEKER, Act. Soc. Nederl., II, Amboina, p. 411; Amboyna.—GÜNTHER, Cat. Fish., II, 1860, p. 228; Japan, China.—NYSTROM, Svensk. Vet. Akad., 1887, p. 28; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 46; Tokyo, Kagoshima.

Head 3 in length; depth $3\frac{1}{2}$; depth of caudal peduncle $3\frac{1}{2}$ in head; eye 6; interorbital space $4\frac{1}{2}$; snout $7\frac{1}{2}$; D. IV, 13; A. 13; scales in lateral series 56.

This species differs from the preceding in having the plates of the head much more rough, the interorbital space and the depression in the bony plate wider, and in color. No dark reticulations are present except on upper part of head and nape, where they are few and much broken up; a broad, dark band passing around body through base of spinous dorsal, the band inky black on the sides, dusky below; a large black spot below posterior end of base of dorsal; a similar spot on cheek; spinous dorsal inky black; soft dorsal, caudal, and pectorals dark, the soft dorsal and caudal narrowly tipped with white, the pectorals broadly edged with white; anal dusky, the tips of the rays white.

Coasts of Japan and southward, not very common. We have a specimen about 250 millimeters long from Misaki and a smaller one from Wakanoura.

(*Bis*, two; *cinctus*, banded.)

6. ICHTHYSCOPUS Swainson.

Ichthyscopus SWAINSON, Nat. Hist. Fish., etc., II, 1839, p. 269 (*inermis*).

Body robust, covered with small scales which are regularly arranged in oblique cross series; head large, entirely mailed above; cheeks naked, preopercle unarmed, covered with soft skin, fringed behind; humeral projection fringed; lower jaw without dilatations below; no filament at the chin or in the mouth; dorsal fin single; the spinous dorsal obsolete.

(*ιχθύς*, fish; *σκοπός*, gazer.)

13. ICHTHYSCOPUS LEBECK (Schneider).

Uranoscopus lebeck SCHNEIDER, Syst. Ichth., 1801, p. 47; (Tranquebar, on a drawing by LeBeck, sent by the missionary, John).

Ichthyscopus lebeckii GILL, Proc. Ac. Nat. Sci. Phila., 1861, p. 114; name only.

Uranoscopus inermis CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 1829, p. 310, pl. LXV; Coromandel, Malabar, Pondicherry.—SCHLEGEL, Fauna Japonica, 1846, p. 27, pl. xa; Nagasaki.—GÜNTHER, Cat. Fish., II, 1860, p. 230; Ceylon, Madras.

Head $2\frac{3}{4}$ in length; depth $2\frac{1}{6}$; depth of caudal peduncle $3\frac{1}{2}$ in head; eye $8\frac{1}{2}$; interorbital space 5; snout $8\frac{1}{2}$; D. 19; A. 16; scales in lateral series about 45.

Head very large, deeper and broader than the body, flat above, the sides vertical; eyes placed on top of head, directed upward, the diameter of orbit equal to length of snout; mouth vertical; lips with prominent transverse ridges, the edges and ends of which are covered with small papillæ; a rather broad band of small teeth on upper jaw: a single row of widely separated, flat, sharp teeth on lower jaw; large plates with villiform teeth on vomer. Pseudobranchiæ very small; gill rakers absent, the first arch with minute, bony setæ; anterior and posterior nostrils with large, low, fringed tubes; opercle with a large flap posteriorly, the upper part with fringed filaments; two fringed flaps, the upper part of which is much the larger, above base of pectoral; their edges meeting, cover a deep depression, forming a tube leading from gill chamber: top of head with slightly rugose plates; depression between eyes very broad, the plates on either side narrow, pointed anteriorly; upper parts of preopercle and opercle with exposed rough plates; no spines.

Scales small, thin, embedded, arranged in oblique rows, the occiput, breast, belly, and head naked; lateral line high up on body near base of dorsal fin.

Spinous dorsal absent, there being but one weak spine before the soft rays; 2 or 3 anterior rays not branched; anal inserted below second or third dorsal ray, extending a little farther posteriorly than the dorsal; caudal convex posteriorly; pectoral large, the fifth and sixth rays longest, the rays below gradually shorter. Rays of anal, ventral and of lower part of pectoral much enlarged, fleshy, and with wrinkled skin near the tips.

Color in spirits, upper parts of body including the dorsal fin brownish, with round, white spots about as large as the orbit, those on dorsal in a row along basal part of fin, those on body in 2 rows, a third represented by 2 or 3 spots; head plain brownish above except opercles and preopercles, which are yellowish white, and the interorbital depression where the skin is covered with small, round, white spots; caudal dusky with elongate, light spot on its upper half; anal and pectorals dusky, bordered with yellowish white.

Described from a specimen about 300 millimeters long from Onomichi. We have other examples from Wakanoura and Hakata.

Coast of southern Japan and southward, rather rare.

(Named for LeBeck, "ardentissimo historiæ naturalis amatori," who figured for Bloch the dolphins of the Ganges.)

7. GNATHAGNUS Gill.

Gnathagnus GILL, Proc. Ac. Nat. Sci. Phila., 1861, p. 115 (*elongatus*).

Head largely bony above, the bones separated by smooth intervals; preopercle with bony cross-ridges, but no sharp spine; no prominence at its angle; opercle broad, with radiating striæ, its edge not fringed;

no fringed appendage to shoulder girdle; mouth vertical; lower jaw prominent, with a short, saber-like dilatation on each side at the chin; these with free pointed tip above; no barbel at the chin or within the mouth. Body covered with very small, smooth scales, which are not arranged in oblique series; humeral spine obsolete; spinous dorsal wanting; soft dorsal rather short; anal longer; ventrals far forward. Japan to Australia.

(*γυάθος*, jaw; *ἀγνός*, an old name for *Uranoscopus scaber*.)

14. GNATHAGNUS ELONGATUS (Schlegel).

Uranoscopus elongatus SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 27, pl. ix, fig. 2; Nagasaki.

Anema elongatum GÜNTHER, Cat. Fishes, II, 1860, p. 230 (after Schlegel).

Head $3\frac{1}{2}$ in length; depth $4\frac{1}{4}$; depth of caudal peduncle $3\frac{1}{2}$ in head; eye $4\frac{3}{8}$; interorbital space $3\frac{1}{4}$; snout 7; D. 13; A. 16.

Body elongate, head broader than body, about as deep, the upper part flat; eyes near top of head, directed obliquely upward, the diameter of orbit greater than length of snout; mouth vertical; teeth of upper jaw in a narrow band, those of lower jaw larger, in 2 rows, the vomer and pharyngeals with bands of villiform teeth. Pseudo-branchiæ prominent; gill-rakers not present, a few small elevations on first arch covered with setæ. Anterior nostril with a short, slender barbel; anterior part of lower jaw with a sharp, flat spine on each side, directed upward; a short, flat, partly concealed humeral spine. Head with bony plates, which are rugose or covered with low, radiating ridges, the plates with naked spaces between them; preopercle with strong ridges, opercle with small, radiating striæ; interorbital depression broad, its width somewhat less than diameter of eye.

Body covered with minute scales, which are not deeply embedded, the belly and breast naked. Lateral line running along upper part of body, abruptly bending downward on caudal peduncle and extending on base of caudal fin.

Spinous dorsal absent, the soft dorsal short; anal inserted much in advance of dorsal and extending farther posteriorly, the rays much lower than those of the latter, their length about equal to depth of caudal peduncle; posterior edge of caudal convex; pectoral broadly rounded posteriorly, contained about $4\frac{1}{2}$ times in length; ventrals 7 in body.

Dusky above, covered with small, round, brown spots on head and body, lighter below, without spots; dorsal, anal, and ventrals with a little dusky color, the pectorals and caudal dark, lighter on the margins.

Coasts of Japan, very rare. A single specimen from Aomori was presented to us by Mr. Sotaro Saito, curator of the Aomori Museum. It is otherwise known from Nagasaki only.

(*Elongatus*, elongate.)

8. ARISCOPUS Jordan and Snyder, new genus.

Ariscopus JORDAN and SNYDER, new genus (*iburius*).

This genus is close to *Gnathagnus*, from which it differs in the absence of scales. Minor characters are the stouter form, the absence of a sharp point on the saber-like dilatation of the lower jaw, and in the presence of a blunt prominence on the angle of the preopercle.

(ἄρι, an intensive particle; σκοπός, gazer.)

15. ARISCOPUS IBURIUS Jordan and Snyder, new species.

Head $2\frac{1}{2}$ in length; depth $3\frac{3}{8}$; depth of caudal peduncle $3\frac{1}{4}$ in head; eye $4\frac{1}{8}$; snout $6\frac{3}{8}$; interorbital space $2\frac{1}{2}$; D. 12; A. 17; P. 22.

Body robust, slightly deeper than head, the caudal peduncle deep, compressed; head broader than body, flat above, the sides vertical. Eyes large, the diameter greater than length of snout, placed high up, directed obliquely; interorbital space slightly concave, the width of depression in occipital plate equal to diameter of eye, its posterior edge on a horizontal between pupil and posterior edge of orbit.



FIG. 4.—ARISCOPUS IBURIUS.

Mouth vertical, maxillary contained 2 times in head, extending posteriorly to a vertical through pupil, the upper edge sliding beneath the preorbital; the lips without fringes; teeth simple, sharp, depressible, those on the upper jaw in a narrow band, on the lower jaw in 2 rows anteriorly, a single row posteriorly; villiform teeth on vomer and pharyngeals. Gill-rakers represented by a few small elevations, the pseudobranchiæ prominent.

Body naked; lateral line running along upper part of body, gradually approaching the dorsal median line until the base of last dorsal ray is reached, where it abruptly bends downward to middle of base of caudal fin; head with plates on the top, their surfaces rugose or with radiating lines and sides; those on the top without any interspaces, fused together into one large plate, extending forward to anterior edges of orbits, the posterior edge straight; a row of narrow, rough plates extending from eye to upper edge of gill-opening, where it ends in a flat humeral spine; suborbital and preorbital plates prominent, preopercle with radiating ridges, the angle with a blunt prominence;

no spines on head; lower jaw with a partly concealed, saber-like attachment on either side, as in *Gnathagnus longatus*, but without sharp spines; anterior nostril with a large tube, the posterior part of which has a slender filament.

Spinous dorsal absent; median rays of soft dorsal highest, their length a little greater than depth of caudal peduncle; caudal truncate posteriorly, its length $4\frac{1}{2}$ in body; anal inserted in advance of the dorsal, the thirteenth or fourteenth ray longest, contained about three times in head, the rays when depressed reaching farther posteriorly than do those of the dorsal, neither touching base of caudal; pectoral rounded, its length $4\frac{1}{4}$ in body; ventrals pointed, 2 in head.

Color in spirits, silvery white, brownish above, with many small, dark brown spots separated by narrower interspaces, the spots extending forward on head and snout; sides of head with minute, dark specks; fins with a little dusky color, the caudal and pectorals darker toward their bases.

Described from a specimen 73 millimeters long, type No. 6544 Leland Stanford Junior University Museum, from Tomakomaki in the province of Iburi, Hokkaido. A second specimen from Volcano Bay is in the museum at Hakodate.

Family IV. CHAMPSODONTIDÆ.

We place provisionally in a separate family a single genus, *Champsodon*, apparently allied on the one hand to *Uranoscopus* and on the other certainly to the Chiasmodontidæ with which Dr. Boulenger places it. But the real affinities of *Chiasmodon* are equally uncertain. The family characters are included below.

9. CHAMPSODON Günther.

Champsodon GÜNTHER, Proc. Zool. Soc. Lond., 1867, p. 102 (*vorax*).

Body rather elongate, fusiform, covered with small, rough, warty, scarcely imbricate scales; belly naked; head flat above, with vertical sides; cheeks and snout scaly; the eyes rather small, high, and near together; mostly directed upward; a small cilium over each eye; mouth large, very oblique, the lower jaw projecting; both jaws with slender teeth of unequal size, some of those below longest; many of them long, slender, depressible canines; a few teeth on vomer; none on palatines; upper jaw with a double notch at tip; preopercle with a strong, curved spine at its angle, the spine about as long as eye; the ascending limb with small teeth; opercle rounded, unarmed; preorbital broad, with a flat, three-lobed spine. Top of head with a low ridge on each side from snout to nape; gill-openings wide, the gill membranes separate, free from the isthmus; isthmus long and narrow, not forming a hump, gill-rakers slender, of moderate length; gills 4, a slit behind the

fourth; suborbitals not dilated; lateral lines 2, the lower curved upward over pectoral; both with lateral vertical branches; the cross rows of tubes on the back more conspicuous than the lateral lines; dorsal fins 2, the first short, the second long, similar to anal; pectoral small and narrow, placed high; ventrals 1, 5, the middle rays longest, inserted before pectorals, but joined to the shoulder girdle by ligament only; caudal forked.

Offshore fishes of the coasts of Asia.

(*Χάμψαι*, crocodile; *ὀδούς*, tooth.)

16. CHAMPSODON VORAX Günther.

Champsodon vorax GÜNTHER, Proc. Zool. Soc. Lond., 1867, p. 102; Shore Fishes, Challenger, 1880, p. 52, pl. xxiii, fig. a; Philippines, Nares Bay, Admiralty Islands, Arafura Sea, Ki Islands; Deep Sea Fishes, Challenger, p. 49; Coast of Japan, Philippines, etc.—ALCOCK, Ann. Mag. Nat. Hist., 1889, p. 381; Bay of Bengal.—GOODE and BEAN, Oceanic Ichthyology, p. 291.

Head $3\frac{3}{8}$ in length, depth $5\frac{1}{8}$; depth of caudal peduncle $4\frac{1}{8}$ in head; eye $4\frac{1}{2}$; snout $3\frac{3}{8}$; interorbital space $6\frac{1}{2}$, D. V., 20; A. 19

Body rather elongate, fusiform in outline, compressed laterally, the caudal peduncle rather narrow. Head large, about as deep as body, the top flat, the sides vertical. Eye placed high in head, directed obliquely upward; interorbital space narrow, concave. Snout slightly longer than diameter of eye. Mouth oblique, the lower jaw projecting, the upper with a double notch at the tip; maxillary extending past eye a distance equal to half the diameter of eye. Teeth long, slender, curved, in two series, the inner ones much enlarged; a small cluster of slender teeth on each side of vomer; none on the palatines; basi-branchials and upper and lower pharyngeals with teeth. Gill rakers, long, slender, pointed, 2 + 10 on first arch. Upper part of head with 2 small bony ridges extending from snout along upper border of eyes, diverging on occiput and ending in a spine on each side at upper edge of gill opening; preopercle with a slender, surved, knife-like spine at its angle; below this 2 or 3 small spines; upper limb of preopercle with minute spines; opercle ending in a soft ciliated flap; preorbital broad, with a strong, three-lobed spine. A small cilium on upper part of eye.

Body covered with small, very rough, scarcely imbricate scales, except on belly, where there is a naked area; head completely scaled except edge of opercle. Two lateral lines, both with vertical branches.

Dorsal spines slender, weak, the first highest, about 3 in head, the others gradually lower. Anal inserted below third dorsal ray, the fin when depressed extending as far posteriorly as the dorsal, just reaching base of caudal. Caudal fin deeply notched. Pectorals small, their length about $2\frac{1}{2}$ in head. Ventrals pointed, $1\frac{1}{2}$ in head.

Color dark steel blue above, sides silvery, mottled with darker, tip

of lower jaw dusky; caudal yellowish, its base blackish; other fins rather pale.

Here described from a specimen 100 millimeters in length from Wakanoura.

East Indian region in rather deep water, north to Japan. Many specimens were collected by us in Waka Bay at Wakanoura. Four others were dredged by the U. S. Fish Commission steamer *Albatross* in Suruga Bay off Enoura. Length 65 to 105 millimeters.

(*Vorax*, voracious.)

Family V. TRICHODONTIDÆ.

THE SAND-FISHES.

Body rather elongate, compressed, naked. Head short, flat on top, the sides vertical. Eyes large, high up, but not superior. Mouth large, almost vertical; lower jaw projecting, its tip entering the profile; lips fringed; premaxillaries protractile; maxillary very broad, without supplemental bone, not slipping under the very narrow pre-orbital. Teeth moderate, slender and sharp, but not setiform, in bands on jaws and vomer; palatines toothless; inner teeth of jaws depressible. Gill rakers short, slender; gill membranes narrowly united, free from the isthmus. Branchiostegals 5. Gills 4, a slit behind the fourth. Pseudobranchiæ large. Preopercle with 5 prominent spines, the 2 upper directed strongly upward, the 2 lower downward, the middle 1 downward and backward; no barbels; opercle small; strongly striate, unarmed; preorbital with spines; no suborbital stay. Lateral line obsolete. Dorsal fins separate, the first the larger, of numerous slender spines; anal fin elongate, without distinct spines, the rays of anterior third of the fin much shorter than the others, the beginning of the fin below middle of spinous dorsal; pectorals with a very broad, curved, procurent base; a broad lunate area between pectoral and gill opening, nearly covered by the opercle; soft rays of dorsal, anal, and pectoral fins all simple; ventrals 1, 5, close together, thoracic, but behind the pectorals, the middle rays longest; caudal lunate, with many accessory rays, on a slender peduncle. Vertebrae numerous, 48 in typical species. North Pacific; living in sand near the shore. The fringed lips and other characters seem to indicate the relationship of these fishes with the *Uranoscopidæ*, but according to Dr. Boulenger these indications are fallacious and the place of the family is next the *Latrididæ*.

- a.* First dorsal long and rather low, of 14 or 15 spines..... *Trichodon*, 10.
aa. First dorsal short and high, of 10 spines *Arctoscopus*, 11.

10. TRICHODON (Steller).

SAND FISHES.

Trichodon STELLER, in Tilesius, Mem. Acad. St. Petersburg, IV, 1811, p. 468 (*trichodon*).

Trichodon CUVIER, Règne Animal, 2d ed., II, 1829, p. 140 (*trichodon*).

Characters of the genus included above, the first dorsal long and rather low, of 15 spines. One species.

($\theta\rho\acute{\iota}\xi$, hair; $\omicron\delta\omicron\upsilon\varsigma$, tooth.)

17. TRICHODON TRICHODON (Tilesius).

HATA-HATA¹ (FLAPPER)

Trachinus trichodon TILESIIUS, Mem. Acad. St. Petersburg, IV, 1811, p. 473, pl. xv, fig. 88; Kamchatka.—PALLAS, Zoographia Rosso-Asiatica, III, 1811, p. 235.

Drachinus trichodon TILESIIUS, Mem. Acad. St. Petersburg, IV, 1811, p. 406; name only.

Trichodon stelleri CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, p. 154, pl. LVII, 1829; based on *Trachinus trichodon*—GÜNTHER, Cat., II, 1860, p. 251—JORDAN and GILBERT, Synopsis, 1883, p. 627.—ISHIKAWA, Prel. Cat., 1897, p. 46; Hokkaido.

Trichodon trichodon JORDAN and EVERMANN, Fish. N. and M. Amer., III, 1898, p. 2295, fig. 806; Herendeen Bay, Monterey, Shumagin Islands.

Trachinus gasteropelecus TILESIIUS, Mem. Acad. St. Petersburg, IV, 1811, p. 466; Kamchatka.

Trichodon lineatus AYERS, Proc. Ac. Nat. Sci. Phila., 1860, p. 60; San Francisco; D. XV—18; A. 28; P. 23.

Head from tip of upper jaw, $3\frac{1}{5}$; depth $3\frac{1}{2}$. D. XIII—I, 18; A. 28; P. 22; eye $4\frac{1}{3}$ in head, snout $4\frac{1}{2}$; maxillary 2; interorbital 3; pectoral $1\frac{1}{8}$; ventral $1\frac{3}{4}$; height of spinous dorsal $3\frac{1}{8}$.

Body moderately elongate, compressed; dorsal outline slightly concave and sloping gently upward from snout to dorsal, thence turning at a very slight angle nearly straight to caudal; ventral outline well rounded from chin to caudal peduncle, the curve much more gradual posteriorly; head and body everywhere covered with thin naked skin. Mouth large, superior, nearly vertical, the lower jaw projecting, its tips entering the profile; lips fringed; maxillary reaching to middle of pupil; teeth in 2 or 3 rows, small, sharp, and recurved; teeth on vomer; palatines toothless. Eyes placed high, their diameter equal to length of snout; interorbital wide and flat, a third wider than eye; top of head smooth, sometimes rugose in younger individuals, covered with thin smooth skin; anterior nostril ending in a tube; preopercle with 5 spines, the one at angle largest, the 2 upper ones pointing upward and backward, the middle one pointing downward and backward, the 2 lower ones pointing downward and forward; opercle with radiating ridges; gill rakers short and slender, numerous.

Origin of spinous dorsal behind base of pectoral, its distance from

¹This name denotes the flapping of a bird's wings.

snout 3 in body, the spines not varying greatly in length, the last one connected by a membrane to the back; soft dorsal well separated from spinous, its rays about equal to spines in length, highest in front; anal long, its origin nearer to the snout than base of caudal by a distance equal to the length of the eye. Pectoral, when spread, broadly rounded behind, its lower rays rapidly decreasing in size below, reaching well past front of anal; ventrals inserted behind base of pectorals a distance equal to $\frac{2}{3}$ eye, their tips reaching to vent. Lateral line running high. Vertebrae $17+30=47$.

Color silvery, light brown above; a dark brown streak following the lateral line, broken up into spots anteriorly; quadrangular, dark brown marks along the back at base of dorsals, chain-like markings in front of dorsal on nape; snout and tip of lower jaw dark; a dark line at lower part of eye; dorsals light, a dark streak along upper part of spinous dorsal; pectorals dusky; ventrals and anal colorless. Length 200 to 250 millimeters.

North Pacific, on sandy shores, from Bering Sea to Monterey, California, and to Hokkaido in Japan; very abundant northward; burying in the sand. Here described from a specimen from Herendeen Bay, Alaska. (U. S. Fish Commission steamer *Albatross* collection.)

We have seen no Japanese specimens, but Ishikawa records it from Hokkaido.

11. ARCTOSCOPUS Jordan and Evermann.

Arctoscopus JORDAN and EVERMANN, Check-List Fishes, 1896, p. 464 (*japonicus*).

This genus differs from *Trichodon* in the short, high, triangular spinous dorsal, which is composed of 10 spines.

(ἄρκτος, northern; σκοπός, gazer; for *Uranoscopus*.)

18. ARCTOSCOPUS JAPONICUS (Steindachner).

HATA-HATA (FLAPPER).

Trichodon japonicus STEINDACHNER, Ichth. Beitr., X, 1881, p. 4; Strielok, near Vladivostok, Sitka.—JORDAN, Cat. Fishes N. A., 1885, p. 117.

Arctoscopus japonicus JORDAN and GILBERT, Rept. Fur Seal Investig., III, 1898, p. 479; Iturup Island, Kurile Group.—JORDAN and EVERMANN, Fish. N. and M. Amer., III, 1898, p. 2297, fig. 867; Iturup Island.

Head $3\frac{3}{4}$ in length, depth $3\frac{1}{4}$; depth of caudal peduncle $3\frac{3}{8}$ in head; eye $3\frac{1}{4}$; snout $1\frac{3}{8}$; interorbital space $6\frac{3}{8}$; D. X. 13; A. 31.

Body deep, greatly compressed, the caudal peduncle narrow. Head rather large, the top flat, the sides sloping inward toward the ventral part; bones of head thin, cavernous; eye large, its diameter greater than length of snout; interorbital space flat, equal in width to pupil; preorbital narrow. Mouth almost vertical, the maxillary extending about to center of pupil, its length contained about 2 times in head; premaxillary protractile; teeth on jaws small, in narrow bands; a

small patch on each side of vomer; pharyngeals smooth. Pseudo-branchiæ large; gill rakers on first arch $5 + 14$, long and slender. Preopercle with 5 large, slender spines, the central and largest one being on the angle; preorbital with a small spine which projects downward; opercle without armature. In our specimens, which are not well preserved, no scales can be detected on the head or body. Lateral lines single, without branches, passing along upper side of body; no trace of a second lateral line can be detected.

Dorsals widely separated; the first spines highest, about $1\frac{1}{2}$ in head; base of second dorsal but little longer than that of the first, the rays somewhat shorter than the spines, when depressed falling far short of base of caudal. Anal fin very long, inserted below eighth dorsal spine, extending to base of caudal, the highest rays contained about $3\frac{1}{2}$ times in head; caudal concave posteriorly; the basal rays extending far forward on caudal peduncle. Pectorals very large, the length contained about $3\frac{1}{2}$ times in length of head and body, the posterior edge truncate.

Color in spirits silvery, with small brownish spots on upper parts; a row of elongate, paired spots along the lateral line. Dorsals, caudal, and pectorals dusky.

Described from a specimen from Kushiro about 120 millimeters long.

North Pacific, rare; recorded from Strielok, Sitka, and Iturup Island. We have in addition 3 specimens from Kushiro, Hokkaido, and one from Tsugaru, near Aomori. The latter is No. 791, *Trichodon* sp., of Ishikawa's list, the specimen being presented by the Imperial Museum. (*Japonicus*, from Japan.)

FAMILY VI. SILLAGINIDÆ.

Body elongate, little compressed, tapering both ways from the spinous dorsal; head rather elongate, conical in profile, the forehead flattened. Eyes lateral, submedian, the preorbital very large, concealing ends of maxillaries. Mouth small, terminal, the premaxillary little protractile. Teeth small, on jaws and front of vomer. Branchiostegals 6; pseudo-branchiæ present. Preopercle entire, bent inward below, covering lower surface of head; opercle small, with a short spine. Skull with muciferous cavities as in *Scienidæ*. Scales small, ctenoid. Lateral line simple, slightly curved, continued to base of caudal or slightly beyond. Dorsal fins 2, the first short, the second very long, similar to anal which has two small spines; caudal emarginate, with rounded lobes; pectorals normal; ventrals 1, 5; thoracic fins almost scaleless. Vertebrae 12 to 16 + 22 to 27. Stomach cæcal, pyloric cæca few. Air bladder simple. Fishes of the East Indian seas, distantly resembling the *Scienidæ*, which are certainly their nearest allies.

a. Teeth uniform; dorsal spines 11 or 12; soft dorsal similar to anal; scales rather small (50 to 90); ventral spine slender *Sillago*, 12.

12. SILLAGO Cuvier.

Sillago CUVIER, Règne Animal, 1st ed., II, 1817, p. 258 (*sihama*=*acuta*).

This genus includes most of the species of the family, including all those with villiform teeth, the soft dorsal and anal similar to each other, the scales small, and the ventral spine normal.

(Name unexplained.)

a. Scales 68 to 75.

b. Scales between lateral line and insertion of dorsal in 4 rows; cheek scales cycloid; D. XI—I, 20 or 21; A. II, 22 or 23; soft dorsal not spotted *sihama*, 19.

bb. Scales between lateral line and insertion of dorsal in 3 rows; cheek scales ctenoid; D. XI—I, 22; A. II, 23 *japonica*, 20.

aa. Scales 82 to 86; seven rows above lateral line, scales of cheek ctenoid; D. XII—I, 22; A. II, 23; soft dorsal spotted *parvisquamis*, 21.

19. SILLAGO SIHAMA (Forskål).

KISUGO.

Atherina sihama FORSKÅL, Descript. Anim., etc., 1775, p. 70; Red Sea.

Platycephalus sihamus SCHNEIDER, Syst. Ichth., 1801, p. 60.

Sillago sihama RÜPPELL, Atlas Reise, N. A., p. 9, pl. iii, fig. 1; Red Sea.—GÜNTHER, Cat. Fish., II, 1860, p. 244; Red Sea, Ceylon, Amoy, Philippines, Nepal, Malayan Peninsula.—GILL, Proc. Ac. Nat. Sci. Phila., 1861, p. 504.—JORDAN and SNYDER, Fishes Formosa, MS.; Formosa.

Sciæna malabarica SCHNEIDER, Syst. Nat., 1801, p. 81, pl. xix; Malabar.

Sillago malabarica GILL, Proc. Ac. Nat. Sci. Phila., 1861, p. 504.

Sillago acuta CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 1829, p. 400; Tranquebar, Pondicherry, Bengal, Java.

Sillago erythræa CUVIER and VALENCIENNES, Hist. Nat. Poiss., III, 1829, p. 409; Red Sea, Suez, Massuah.

Head, $3\frac{1}{2}$ in length, depth, $6\frac{1}{2}$; depth of caudal peduncle, $4\frac{1}{2}$ in head; eye, 5; snout, $2\frac{2}{5}$; interorbital space, $5\frac{1}{2}$; pectoral, $7\frac{1}{2}$ in length; ventral, $7\frac{1}{2}$; caudal, 6; D. XI—I, 20; A. II, 23; scales in lateral line, 69; in transverse series, 14; between lateral line and insertion of dorsal, 4.

Body elongate, slightly compressed, the caudal peduncle narrow; ventral contour almost straight, the dorsal outline rising evenly and gently from snout to dorsal fin; head elongate, the snout long and sharp. Eye large, located midway between tip of snout and edge of opercle; interorbital space slightly convex. Mouth small, somewhat oblique, maxillary contained $4\frac{3}{4}$ times in head. Bands of minute, simple teeth on both jaws, an outer single row of enlarged ones both above and below, but no canines; a broad patch of vomerine teeth present. Gill-rakers on first arch, 4 or 5 + 9, short, slender; pre-opercle with a few broad, weak spines.

Body covered with finely ctenoid scales, occiput, cheeks and throat with smooth scales, the snout smooth; basal half of caudal with minute scales, the other fins smooth. Lateral line complete, passing along upper part of body, then bending downward to middle of caudal peduncle.

Dorsals separate, the spinous dorsal inserted on a line passing a little behind base of ventrals, the soft dorsal inserted immediately above anal, both fins extending an equal distance posteriorly; caudal notched, pectorals and ventrals pointed.

Color in spirits, plain brownish yellow, a faint trace of dusky on the distal parts of the fins.

Coast of India, from the Red Sea to Japan, generally common; our specimens from Tokyo, Tsuruga, Onomichi, and Formosa. It is apparently much less common than *S. japonica*, on the coasts of Japan. Dr. Gill separates *S. malabarica* as a distinct species having the soft dorsal spotted. Our specimens agree with *S. sihama* in this regard. (*Sihama*, an Arab name.)

20. SILLAGO JAPONICA Schlegel.

AOGISU (BLUE KISUGO).

Sillago japonica SCHLEGEL, Fauna Japonica Poiss., 1846, p. 33, pl. x, fig. 1; Nagasaki.—BLEEKER, Act. Nederl. Sooc., Indo-Nederl., III, Japan, p. 11.; Bali, III, p. 163; Bali.—GILL, Proc. Ac. Nat. Sci. Phila., 1861, p. 504.—STEINDACHNER and DÖDERLEIN, Fische Japans., III, 1884, p. 24; Tokyo.—NYSTROM, Svensk. Vet. Ak., 1887, p. 29; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 46; Tokyo, Kishin.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 369; Tokyo.

Head $3\frac{1}{8}$ in length; depth $5\frac{2}{3}$; depth of caudal peduncle $3\frac{1}{8}$ in head; eye $4\frac{1}{2}$; snout $2\frac{1}{2}$; interorbital space $4\frac{1}{2}$; pectoral $6\frac{3}{4}$ in length; ventral $7\frac{2}{3}$; caudal $6\frac{1}{2}$; D. XI—I, 22; A. II, 23; scales in lateral line 70; in transverse series 16; between lateral line and insertion of dorsal 3.

This species closely resembles *S. sihama*, differing from it mainly in having the scales of the head ctenoid, and in having larger scales above the lateral line, there being but three series between lateral line and insertion of dorsal.

Coasts of Japan and southward to Molucca; everywhere common, especially southward from Matsushima; an important food-fish. Our specimens are from Hakodate, Matsushima, Tokyo, Misaki, Niigata, Tsuruga, Wakanoura, Hiroshima, Onomichi, Kawatana, Hakata, and Nagasaki.

21. SILLAGO PARVISQUAMIS Gill.

Sillago parvisquamis GILL, Proc. Ac. Nat. Sci. Phila., 1861, p. 505; Kanagawa, near Yokohama.

Head $3\frac{5}{8}$ in length; depth $6\frac{1}{2}$; depth of caudal peduncle 4 in head; eye $5\frac{1}{2}$; snout $2\frac{1}{4}$; interorbital space $4\frac{1}{2}$; pectoral 7 in length; ventral $7\frac{2}{3}$; caudal 7; D. XII—I, 22; A. II, 23; scales in lateral line 82; in transverse series 17; between lateral line and insertion of dorsal 6.

Sillago parvisquamis is easily distinguished from *S. sihama* by the smaller scales on body, there being a larger number in the lateral line and between the insertion of dorsal and lateral line. The scales of the

head in this species are ctenoid. Another prominent mark of distinction is a series of 3 rows of small dusky spots on the rays of the soft dorsal.

Coast of Japan, thus far recorded only from Tokyo Bay, where our two specimens were taken.

(*Parvus*, small; *squama*, scale.)

Family VII. LATILIDÆ.

Body more or less elongate or compressed. Head subconical, the anterior profile usually convex; suborbital without bony stay; the bones not greatly developed; cranial bones not cavernous; opercular bones mostly unarmed. Mouth terminal, little oblique; teeth rather strong; no teeth on vomer or palatines; the premaxillary usually with a blunt posterior canine, somewhat as in the *Labridæ*; premaxillaries protractile; maxillary without supplemental bone, not slipping under the edge of the preorbital. Gills 4, a long slit behind the fourth: pseudobranchiæ well developed; gill membranes separate, or more or less united; lower pharyngeals separate. Scales small, ctenoid; lateral line present, complete, more or less concurrent with the back; dorsal fin relatively long and low, usually continuous, the spinous portion always much less developed than the soft portion, but never obsolete; anal fin very long, its spines feeble and few; caudal fin forked; tail homocercal; ventrals thoracic I, 5, close together; pectoral fins not very broad, the rays all branched; vertebræ in normal or slightly increased number (24 to 30). Pterygials long, hour-glass shaped, resting on both coracoids. Pyloric cæca few or none. Fishes of the temperate and tropical seas, some of them reaching a large size. Boulenger places these fishes with the Pseudochromididæ, and most late writers with the Malacanthidæ. There is no evidence of any close relationship to either, and we provisionally give the group family rank.

a. Latilinae.—Soft dorsal and anal moderate, each of 13 to 15 soft rays; preopercle denticulate; scales small; form robust; nape and lips without adipose appendages.

Latilus, 13.

13. LATILUS Cuvier and Valenciennes.

Coryphænoides LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 176, (*houduymijaponicus*) (not of Gunner, a genus of *Macrouridæ* of prior date).

Latilus CUVIER and VALENCIENNES, Hist. Nat. Poiss., V, 1830, p. 368, (*argentatus*).

Body rather elongate, compressed, covered with small silvery, finely ciliated scales. Mouth horizontal, moderate, the jaws subequal; eye large, lateral; jaws with villiform teeth, besides a posterior canine; no teeth on vomer or palatines; preopercle serrate, opercle entire. Pseudobranchiæ present. Branchiostegals six. No adipose appendage on nape; no appendage to the lips. Dorsal rays about VII-14,

the fin continuous; anal rays II, 11. Air bladder simple; pyloric cæca few. East Indies.

(Name unexplained, perhaps from *latus*, broad.)

22. LATILUS JAPONICUS (Houttuyn).

AMADAI (SWEET PERCH OR LADY PERCH), KUSUNA.

Coryphæna japonica HOUTTUYN, Holl. Maats. Weet. Harlem, XX, 1782, p. 311; southern Japan.

Latilus japonicus JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1901, p. 745 (identification of Houttuyn)—JORDAN and SNYDER, Fishes of Formosa, MS; Giran, Formosa.

Coryphænoïdes houttuyni LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 176 (after Houttuyn).

Coryphæna sinensis LACÉPÈDE, Hist. Nat. Poiss., III, 1802, pp. 176, 209; on a Chinese painting.

Latilus sinensis JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1901, p. 369; Tokyo.

Latilus argentatus CUVIER and VALENCIENNES, Hist. Nat. Poiss., V, 1830, p. 369; locality uncertain; IX, p. 495, Japan.—SCHLEGEL, Fauna Japonica, 1846, p. 63, pl. xxviii, fig. 2; Nagasaki.—BLEEKER, Verh. Bat. Gen., XXVI, p. 85.—GÜNTHER, Cat. Fish., II, 1870, p. 252; China.—NYSTROM, Svensk. Vet. Ak., 1887, p. 29; Nagasaki.—ISHIKAWA, Prel. Cat., 1897, p. 45; Tagato, Nagato.

Head $3\frac{3}{8}$ in length; depth $3\frac{1}{2}$; depth of caudal peduncle $2\frac{3}{8}$ in head; eye 4; snout $2\frac{3}{8}$; interorbital space 4; pectoral $3\frac{3}{8}$ in length; ventral $6\frac{3}{8}$; caudal $4\frac{1}{4}$; D. 21; A. 14; scales in lateral line 70; in transverse series 25.

Body elongate, compressed, the caudal peduncle deep; ventral contour almost straight, dorsal contour very steep on snout, rounded above eye, then passing gently upward and backward to insertion of dorsal fin. Eye large, in upper part of head, equidistant from tip of snout and posterior edge of opercle; interorbital space convex, suborbital broader than the diameter of eye. Anterior nostril with a low rim. Jaws subequal, the lower slightly included; cleft of mouth almost horizontal; maxillary partly concealed by the suborbital, extending to a vertical through center of pupil, the length $2\frac{3}{8}$ in head; premaxillaries very protractile. Teeth of the upper jaw in 2 series, an outer single row of enlarged teeth, and an inner narrow band of minute ones; those of the lower jaws similar, the inner band confined to the anterior part of jaw, the outer row extending backward; 1 or 2 of the posterior teeth of upper jaw canine-like. Gill rakers on first arch 7+13, long and slender near middle of arch, becoming very small at the ends; pseudobranchiæ large. Posterior edge of preopercle finely denticulate.

Body covered with finely ctenoid scales, except on upper anterior parts and on breast, where the scales are cycloid; occiput, preopercle, and opercle with cycloid scales; those on the occiput very small; interorbital space, snout, suborbital and jaws naked. Lateral line not very distinct, extending along upper part of body on the seventh or

eighth row of scales below dorsal fin; minute scales extending a short distance on base of pectoral, and on the basal half of caudal; membranes of other fins without scales.

Insertion of dorsal fin immediately above base of pectoral, the first ray somewhat shorter than diameter of eye, other rays gradually longer to the third from the last, which is contained about $1\frac{2}{3}$ times in length of head. Anal inserted below eleventh ray of dorsal, similar in shape to dorsal, the longest or next to last ray $1\frac{1}{2}$ in head. Caudal subtruncate, the upper and middle rays slightly longer than the lower ones. Pectorals sharply pointed, of peculiar shape; the upper rays consecutively longer from the upper edge to middle of fin, the ray below the long central one abruptly shortened, about one-third the length of the latter; the others growing consecutively shorter. Ventrals bluntly pointed.

Color in alcohol, pale pinkish brown with numerous, narrow, dusky, vertical bands on upper parts of body. Fins dusky toward the margins.

Here described from a specimen about 290 millimeters long collected at Nagasaki.

In life, the upper parts of head and body are bluish, suffused with red, becoming brassy anteriorly, the latter color reflected from other parts of body in a less intense degree; dorsal fin suffused with red; membranes of anal transparent at base, dead white with a bluish reflection on other parts; pectoral similar to anal; ventral suffused with red.

Shores of China and southern Japan; a common food fish of the clear waters, reaching a length of about 600 millimeters. Our numerous specimens are from Nagasaki, Wakanoura, Tokyo, and Giran, Formosa.

Family VIII. PSEUDOCHROMIDIDÆ.

Head and body oblong, covered with moderate-sized, ciliated scales; lateral line interrupted of the two parts, the posterior part lower down; cleft of mouth oblique, the lower jaw longest; teeth cardiform; sides of head unarmed; preopercle entire; eyes lateral. Dorsal fin single, with a few spines in advance. Ventrals thoracic, I, 5; pectoral rays branched. Gill membranes united. No pyloric cæca; pseudobranchiæ and air bladder present. Tropical fishes, perhaps allied to the Seranidæ, having considerable in common with *Gramma*, *Rhegma*, *Plesiops*, and other genera with interrupted lateral line.

a. Palatines without teeth; dorsal spines 2; anal spines 3 *Cichlops*, 14.

14. CICHLOPS Müller and Troschel.

Cichlops MÜLLER and TROSCHER, Horæ Ichthyol., III, p. 24 (*cyclophthalmus*).

Labracinus SCHLEGEL, Ms., Bleeker, Ac. Néerl. Sci., 1875, p. 5 (*cyclophthalmus*).

This genus is separated from *Pseudochromis* chiefly by the absence of palatine teeth.

(*Cichla*, a genus of South American river-fishes, from *κίχλη*, a thrush, a name applied to the black Wrasse; *ὤψ*, appearance.)

23. CICHLOPS CYCLOPHTHALMA Müller and Troschel.

Cichlops cyclophthalmus MÜLLER and TROSCHER, Hor. Ichth., III, p. 24, pl. iv, fig. 1, Sunda Sea.—GÜNTHER, Cat. Fish., II, 1860, p. 259.—BLEEKER, Act. Soc. Néerl., 1875, p. 8; Celebes.

Cichlops japonicus GILL, Proc. Ac. Nat. Sci. Phila., 1859, p. 147; Shimoda.

D. II, 25; A. III, 14; P. 19; V. I, 5; scales 52.

The Japanese specimen called *Cichlops japonica* is close to *Cichlops cyclophthalma* Müller and Troschel, described from the Sunda Sea. According to Gill "it is chiefly distinguished . . . by the position of the bases of the ventrals under the lower angles of those of the pectorals. The color is tawny, much darker in the centres of the scales on the back and on the sides above the pectorals. The posterior border of the orbit is margined by a black crescent. The dorsal has a few minute black dots. The membranous margin of the preopercle presents the appearance of being sustained by rays."

A single specimen about 4 inches long was collected at Shimoda in Izu, by Dr. J. Morrow, of the expedition of Commodore Perry. It was not seen by us. In *C. cyclophthalma*, said to have the same form, the head is 5 in total length with caudal, the depth $4\frac{1}{4}$; eye a little less than snout, equal to interorbital width. Bleeker regards *Cichlops japonica* as an undoubted synonym of *Cichlops cyclophthalma*, and we see no reason to doubt the correctness of this view.

(κύκλος, round; ὀφθαλμός, eye.)

Family IX. OPISTHOGNATHIDÆ.

THE JAW-FISHES.

Body oblong or elongate, low, moderately compressed, covered with small cycloid scales; lateral line present, straight, running close to the dorsal fin, not extending much behind middle of body. Head large, naked, the anterior profile decurved, no ridges, spines, or crests above. Mouth terminal, horizontal, its cleft usually very wide, the maxillary sometimes greatly dilated; supplemental maxillary present; premaxillaries protractile; jaws subequal, with conical or cardiform teeth; vomer usually with a few teeth; palatines toothless; opercles unarmed; no suborbital stay. Pseudobranchiæ present. Gill rakers rather long; gills 4, a slit behind the fourth; gill membranes somewhat united, free

from the isthmus. Branchiostegals 6. Air bladder present. No pyloric cæca. Vertebrae large, about 27 in number. Dorsal fin long, continuous, its anterior half composed of slender, flexible spines, which pass gradually into soft rays; caudal distinct, rounded or lanceolate; tail not isocercal, the last vertebra expanded (27 to 34); anal long and low, without distinct spines; ventrals separate, thoracic I, 5, the middle rays longest; pectorals fan shaped. Small fishes inhabiting rocky bottoms in tropical seas, many of them with bright markings. The species are almost everywhere all rarities, living about rocks in deep or shallow water; nowhere abundant. This group is very closely related to the Pseudochromididæ with which Dr. Boulenger unites it, apparently with justice.

- a. Maxillary not of inordinate length, truncate behind, much shorter than head; caudal moderate, rounded behind; body oblong, moderately compressed.
- b. Dorsal spines all simple..... *Gnathypops*, 15.
- bb. Dorsal fin with the anterior spines transversely forked or Y-shaped; maxillary about half length of head..... *Stalix*, 16.

15. GNATHYPOPS Gill.

Gnathypops GILL, Proc. Ac. Nat. Sci. Phila., 1860, p. 241 (*maxillosus*).

This genus differs from *Opisthognathus* in having the maxillary of medium length and truncate behind, not extending to edge of opercle; caudal moderate, rounded behind. Dorsal spines all simple and normal. Species in form and habit agreeing closely with those of *Opisthognathus*.

(γνάθος, jaw; ὕπο, below; ὤψ, eye.)

- a. Dorsal, anal and caudal plain, without dark bands; dorsal rays X 14; anal II, 12; scales 60..... *hopkinsi*, 24.
- aa. Dorsal, anal, and caudal with dark bands; opercle without black blotch; caudal bordered with black; ventrals dark. D. X, 11; A. II, 10; scales 48.
evermanni, 25.

24. GNATHYPOPS HOPKINSI Jordan and Snyder, new species.

Head $3\frac{1}{4}$ in length, depth $4\frac{3}{8}$; depth of caudal peduncle $2\frac{3}{8}$ in head; eye $3\frac{1}{2}$; snout 6; interorbital space 11; D. X, 14; A. II, 12; scales in lateral series 60.

Body compressed, the caudal peduncle deep, dorsal outline of body not much elevated. Head large, broader than body, the anterior profile steep, rounded; snout short, blunt, the jaws equal. Eye large, the diameter greater than length of snout, placed high in head and anteriorly; directed obliquely upward and forward; interorbital space about as wide as pupil, convex. Mouth very large, the maxillary extending far beyond eye, its length $1\frac{1}{2}$ in head, the upper edge with a small supplemental bone, the posterior end of which projects beyond edge of maxillary. Teeth in narrow bands on anterior part of jaws,

in single rows posteriorly, the outer and the posterior ones enlarged, those on the posterior part of the lower jaw fang-like, curved backward; no teeth on the vomer, palatines, or tongue; pharyngeal teeth villiform. Pseudobranchiæ small, in a small pocket at upper end of gill arches; gill rakers on first arch $15 + 26$, very long and slender.

Head naked, the bones without spines, no cirri; body covered with very thin cycloid scales, the nape, a narrow area along base of dorsal fin, and the breast naked. Lateral line incomplete, extending along base of spinous dorsal, traces of it extending farther back.

Dorsal fins continuous, gradually increasing in height posteriorly, the tenth or eleventh ray highest, contained about $1\frac{1}{2}$ times in head. Anal inserted below the second dorsal ray, the seventh or eighth ray highest, contained about 2 times in head, both anal and dorsal reach-

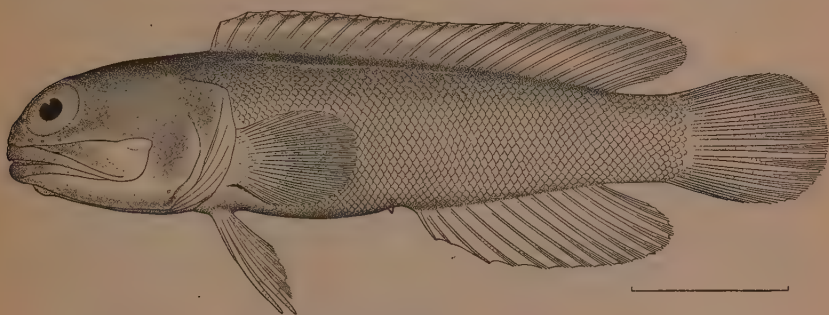


FIG. 5.—GNATHYPOPS HOPKINSI.

ing when depressed considerably beyond base of caudal fin. Caudal rounded, its length $1\frac{2}{3}$ in head. Pectorals rounded, 2 in head. Ventrals $1\frac{3}{4}$ in head, 2 of the rays simple, projecting beyond membrane of fin.

Color in alcohol light olive, brownish on upper part of head and cheeks and along back, the dark color extending on base of dorsal; a broad, light, longitudinal band on dorsal, the fin bordered with dusky, narrowly tipped with white; caudal and pectorals dusky, anal and ventrals white.

The species is represented by a single individual about 80 millimeters long, collected at Misaki and presented by Professor Mitsukuri, of the Imperial University. It is numbered type 6541, Leland Stanford Junior University Museum.

(Named for Timothy Hopkins, of Menlo Park, California, in recognition of his invaluable aid in our explorations of Japan.)

25. GNATHYPOPS EVERMANNI Jordan and Snyder, new species.

Head $2\frac{7}{8}$ in length, depth $3\frac{3}{8}$; depth of caudal peduncle 3 in head; eye 3; interorbital space 12; snout $7\frac{1}{2}$; D. X, 11; A. II, 10; P. 19; scales in lateral series 48; in transverse series 18.

Body deep, compressed, the caudal peduncle especially so; dorsal contour rounded, the ventral line nearly straight. Head large, its width greater than that of body. Eyes very large, in anterior part of head, directed obliquely upward and forward; interorbital space narrow, concave. Mouth exceedingly large, the maxillary extending beyond eye a distance about equal to half its length, contained $1\frac{1}{2}$ times in head, the posterior edge broad, truncate, not slipping beneath preorbital; a supplemental bone on upper posterior edge. Teeth long, slender in a single row in each jaw; upper jaw with 4 small, curved fangs at tip just behind the other teeth; vomer and palatines without teeth, pharyngeals with villiform teeth. Pseudobranchiæ present; gill rakers very long and slender, $11 + 18$ on first arch.

Head naked, without tentacles or spines; body with small cycloid scales, a narrow area on breast naked. Lateral line incomplete, passing along upper part of body to near insertion of soft dorsal where it ends.

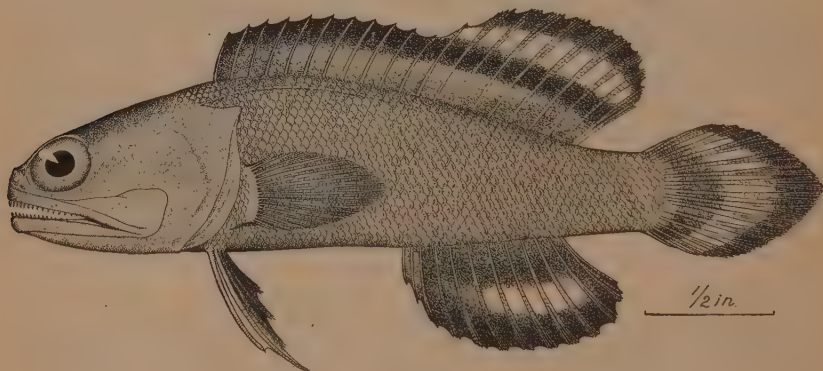


FIG. 6.—GNATHYPOPS EVERMANNI.

Dorsal fins united, the spinous dorsal inserted above upper edge of gill opening, the posterior rays slightly higher than the anterior ones, contained 3 times in head; the rays higher than the spines, the longest contained about $1\frac{3}{4}$ in head; when depressed, the tips of the posterior rays just touch the base of caudal. Anal inserted slightly in advance of beginning of soft dorsal, the fin not reaching as far posteriorly as does the latter. Caudal acutely rounded, contained 4 times in length. Pectoral pointed, 5 in length. Second ray of ventral longest, $4\frac{1}{2}$ in length.

Color brownish, each scale edged with darker. A broad blackish band along upper part of spinous dorsal, continued along near middle of soft dorsal, above this a light band on soft dorsal bordered by a dark marginal band. Caudal with a narrow, lunate, vertical light band at base, then a broad dark band followed by a light one, and finally a terminal dark border. Anal very dark, becoming black along the border, an elongate, white area near the center. Ventral dark, the membrane between the outer rays white. Pectorals dusky.

Two specimens, one, the type, No. 6542, Leland Stanford Junior University Museum, the other in U. S. National Museum, were obtained from the fishermen's boats at Wakanoura, Kii. They measure about 80 millimeters in length.

(Named for Dr. Barton Warren Evermann, ichthyologist of the U. S. Fish Commission.)

16. STALIX Jordan and Snyder, new genus.

Stalix JORDAN and SNYDER, new genus (*histrio*).

This genus is allied to *Gnathypops*, from which it is mainly distinguished by the form of the anterior spines of the dorsal fin, which are Y-shaped, transversely forked, as described below. The head is short and blunt, and the maxillary relatively very short, about half length of head. The single known species is Japanese.

(στάλιξ, a forked stick.)

26. STALIX HISTRIO Jordan and Snyder, new species.

Head $3\frac{2}{3}$ in length; depth 4; depth of caudal peduncle $2\frac{1}{3}$ in head; eye $3\frac{2}{3}$; snout 7; interorbital space 11; D. XI, 9; A. II, 11; scales in lateral series 48; in transverse series 19.

Body rather elongate, compressed, the dorsal contour not elevated; head a little broader and about as deep as body. Eye very large, placed in anterior part of head, directed obliquely forward, the upper rim

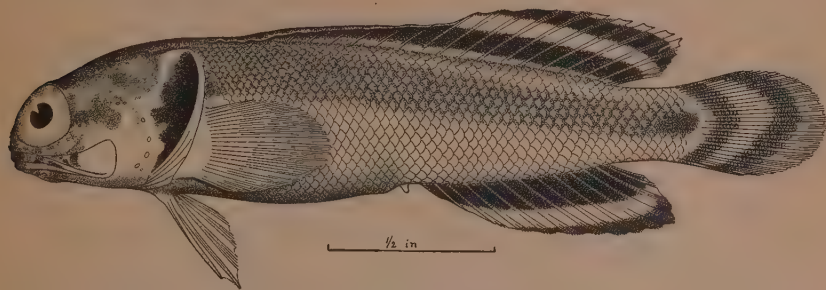


FIG. 7.—STALIX HISTRIO.

projecting above contour of head; interorbital space narrow, concave. Snout blunt, rounded, jaws subequal, the lower slightly shorter than the upper. Mouth horizontal, the maxillary extending far beyond orbit, its length about $1\frac{1}{3}$ in head, truncate posteriorly, a small supplemental bone on the upper edge. Teeth on the jaws in narrow bands anteriorly, the bands narrowing and becoming a single row posteriorly; no teeth on vomer or palatians. Gill-rakers on first arch 8+10, very long and slender; pseudobranchiæ present.

Body with medium-sized, thin, cycloid, loosely attached scales; a small naked area on nape and on breast and belly, the head naked,

and without spines or cirri. Lateral line incomplete, extending along back near base of spinous dorsal.

Dorsal fins continuous, the spinous dorsal of peculiar structure, the five anterior spines forked or Y shaped, the arms of the Y extending transversely, the fleshy fin membrane having a lateral fold on either side and a convexity along the dorsal surface, conforming to the shape of the spines, the posterior spines shaped as usual; soft rays higher than the spines, the longest contained about $1\frac{3}{4}$ times in head. Caudal rounded posteriorly. Anal inserted below beginning of soft dorsal, the rays about equal in length to those of the dorsal; when depressed both dorsal and anal reach the base of caudal. Pectorals rounded, about $1\frac{3}{4}$ in head. Ventrals pointed, about as long as the pectorals.

Upper sides with a broad, dusky band extending from gill-opening to middle of base of caudal where it is darkest; head dark on the upper and anterior surface, the opercle with a broad blackish patch extending nearly over its surface; a dark longitudinal band covering the greater part of spinous dorsal and extending along basal half of soft dorsal, a narrow light band along base of both fins, a second dark band on the soft dorsal, separated from the first by a light space of about equal width, the fin with a light margin posteriorly. Caudal with two lunate, dusky bands, the fin with a broad light margin. Pectorals and ventrals immaculate.

The species is represented by a specimen 62 millimeters long from Nagasaki. Type No. 6543, Leland Stanford Junior University Museum.

(*Histrion* = *harlequin*.)

SUMMARY.

Group TRACHINOIDEA.

Family I. NOTOTHENIIDÆ.

1. *Parapercis* Bleeker.

1. *pulchella* (Schlegel); Wakanoura, Nagasaki.
2. *ommatura* Jordan and Snyder; Kobe, Tsuruga, Tokyo, Wakanoura, Nagasaki.
3. *hexophthalma* (Ehrenberg).

2. *Neopercis* Steindachner.

4. *sexfasciata* (Schlegel); Tokyo, Awa, Hiroshima, Misaki, Onomichi, Kobe, Wakanoura, Tsuruga, Nagasaki, Suruga Bay, Sagami Bay, Owari Bay.
5. *multifasciata* (Döderlein); Tokyo, Owari Bay, Suruga Bay, Sagami Bay.
6. *aurantiaca* (Döderlein).

3. *Bembrops* Steindachner.

7. *caudimacula* Steindachner.

4. *Pteropsaron*¹ Jordan and Snyder.

8. *evolans* Jordan and Snyder; Suruga Bay, Sagami Bay.
9. *verecundum* Jordan and Snyder, Suruga Bay.

¹ See footnote on page 469: *Pteropsaron* is a congener of *Parapercis* and *Neopercis*, and it is doubtful whether any of these really belong to *Nototheniidæ*.

Family III. URANOSCOPIDÆ.

5. *Uranoscopus* Linnæus.

- 10. *oligolepis* Bleeker.
- 11. *japonicus* Houttuyn; Tokyo, Wakanoura, Hakata.
- 12. *bicinctus* Schlegel; Wakanoura, Misaki, Tokyo.

6. *Ichthyoscopus* Swainson.

- 13. *lebeck* (Schneider); Wakanoura, Onomichi, Hakata.

7. *Gnathagnus* Gill.

- 14. *elongatus* (Schlegel); Aomori.

8. *Ariscopus* Jordan and Snyder.

- 15. *iburius* Jordan and Snyder; Tomakomaki.

Family IV. CHAMPSODONTIDÆ.

9. *Champsodon* Günther.

- 16. *vorax* Günther; Wakanoura, off Enoura.

Family V. TRICHODONTIDÆ.

10. *Trichodon* (Steller).

- 17. *trichodon* (Tilesius).

11. *Arctoscopus* Jordan and Evermann.

- 18. *japonicus* (Steindachner); Kushiro, Tsugaru, Iturup Island.

Family VI. SILLAGINIDÆ.

12. *Sillago* Cuvier.

- 19. *sihama* (Forskål); Tokyo, Tsuruga, Onomichi.
- 20. *japonica* Schlegel; Hakodate, Matsushima, Tokyo, Misaki, Wakanoura, Tsuruga, Onomichi, Hiroshima, Hakata, Kawatana, Nagasaki.
- 21. *parvisquamis* Gill; Tokyo.

Family VII. LATILIDÆ.

13. *Latilus* Cuvier and Valenciennes.

- 22. *japonicus* (Houttuyn); Tokyo, Wakanoura, Nagasaki.

Group II. PERCIFORM FISHES OF DIVERSE AFFINITIES.

Family VIII. PSEUDOCROMIDÆ.

14. *Cichlops* Müller and Troschel.

- 23. *cyclophthalma* Müller and Troschel.

Family IX. OPISTHOGNATHIDÆ.

15. *Gnathypops* Gill.

- 24. *hopkinsi* Jordan and Snyder; Okinose near Misaki.
- 25. *evermanni* Jordan and Snyder; Wakanoura.

16. *Stalix* Jordan and Snyder.

- 26. *histrion* Jordan and Snyder; Nagasaki.

ILLUSTRATIONS AND DESCRIPTIONS OF NEW, UNFIGURED, OR IMPERFECTLY KNOWN SHELLS, CHIEFLY AMERICAN, IN THE U. S. NATIONAL MUSEUM.

By WILLIAM HEALEY DALL,
Honorary Curator, Division of Mollusks.

During the last thirty years a large number of species have been described by me in various publications which it was, at the time of publication, impracticable to figure. There are also a number of species described by others which have either been inadequately illustrated, figured in almost inaccessible publications, or not figured at all. Of the many undescribed species in the national collection some few have been distributed with manuscript names, for reasons which seemed sufficient at the time. With the view of suitably illustrating these species and eventually preparing an illustrated list or manual for American collectors and students, I have been accumulating a store of drawings of which the present paper includes a selection. Many more, especially species obtained by Mr. and Mrs. Oldroyd in the vicinity of San Pedro, California, are reserved for a future occasion.

With the exception of the first species, a remarkable Malayan *Nanina*, the forms figured are all American, and for convenience are divided into three series, including, respectively, the species of land shells, the East American marine forms, and the marine species from the Pacific coast.

Some systematic and nomenclatorial notes on the species and genera illustrated, and especially on the *Buccininae* and *Chrysodominae* so richly developed on our northwest coast, are included, together with some descriptions of new forms and a review of the northern species of the genus *Boreotrophon*, and it is hoped as a whole that the paper will furnish welcome information to many students of American mollusks.

LANDSHELLS.

NANINA (MACROCHLAMYS?) DIADEMA Dall.

Plate XXVII, figs. 1, 2, 3.

Nanina (Macrochlamys?) diadema DALL, Nautilus, XI, No. 4, Aug., 1897, p. 37:

Collected in the vicinity of Prang, Malay Peninsula, by Dr. W. L. Abbott. U.S.N.M., 150277. The color is an olivaceous yellow-brown.

VITREA RADERI Dall.

Plate XXVII, figs. 4, 5, 6.

Vitrea raderi DALL, Nautilus, XI, No. 9, Jan., 1898, p. 100.—PILSBRY, Class. Cat., p. 26, 1898.

Collected at Cumberland, Maryland, by Rader, and forwarded to the National Museum by Prof. Howard Shriver. U.S.N.M., 107758. Shell of a waxen whitish color. The edge of the aperture in the specimen figured is slightly defective.

PUNCTUM RANDOLPHII Dall.

Plate XXVII, figs. 7, 8, 9.

Pyramidula? randolphii DALL, Nautilus, VIII, No. 11, Mar., 1895, p. 130.

Punctum randolphii PILSBRY, Nautilus, IX, No. 2, June, 1895, p. 18; Class. Cat., p. 33, 1898.

Collected near Seattle, Washington, under leaves, by P. B. Randolph. The color is a dark reddish brown with silky luster. U.S.N.M., No. 107542.

ZONITOIDES (PSEUDOHYALINA) PUGETENSIS Dall.

Plate XXVII, figs. 10, 12.

Patulastra? (Punctum?) pugetensis DALL, Nautilus, VIII, No. 11, Mar., 1895, p. 130.

Pseudohyalina pugetensis PILSBRY, Nautilus, IX, No. 2, June, 1895, p. 18.

Zonitoides milium pugetensis PILSBRY, Class. Cat., p. 28, 1898.

Collected near Seattle, Washington, by P. B. Randolph, under leaves. Shell with fine silky sculpture and of a pale greenish yellow color. The Pacific coast analogue of the eastern *Z. milium*. U.S.N.M., 107541.

ASHMUNELLA RHYSSA Dall.

Plate XXVII, figs. 11, 14.

Polygyra rhyssa DALL, Nautilus, XI, No. 1, May, 1897, p. 2.—PILSBRY, Class. Cat., p. 10, 1898.

Ashmunella rhyssa PILSBRY, Proc. Acad. Nat. Sci. Phila. for 1899, p. 188.

Collected in the White Mountains of New Mexico by Rev. E. H. Ashmun. It is of a dark yellowish brown color with a rather raggedly rough surface, harsher to the touch than any of the other species of this group. U.S.N.M., 107633.

ASHMUNELLA PSEUDODONTA Dall.

Plate XXVII, figs. 13, 15; Plate XXVIII, fig. 7.

Polygyra pseudodonta DALL, Proc. U. S. Nat. Mus., XIX, Jan., 1897, p. 343.

Ashmunella pseudodonta PILSBRY, Proc. Acad. Nat. Sci. Phila. for 1899, p. 188.

Collected at White Oaks, New Mexico, at an altitude of 7,000 feet, by Rev. E. H. Ashmun. The types are of a yellowish straw color. U.S.N.M., 107611.

ASHMUNELLA ASHMUNI Dall.

Plate XXVIII, figs. 4, 6, 9.

Polygyra ashmuni DALL, Proc. U. S. Nat. Mus., XIX, Jan., 1897, p. 342.

Collected at Bland, New Mexico, at a height of 8,000 feet above the sea, by the Rev. E. H. Ashmun. U.S.N.M., 107610.

HOLOSPIRA (HAPLOSTEMMA) HAMILTONI Dall.

Plate XXVIII, figs. 2, 11.

Holospira (Haplostemma) hamiltoni DALL, Nautilus, XI, No. 4, Aug., 1897, p. 38.

Collected in the Rio Grande Mountains, Brewster County, Texas, at a height of 3,500 feet, feeding on *Selaginella lepidophylla* Spring, by James M. Hamilton. The shell is pinkish white with a darker livid apex. U.S.N.M., 107759.

CERES NELSONI Dall.

Plate XXVIII, figs. 1, 3, 5, 8.

Ceres nelsoni DALL, Nautilus, XII, No. 3, July, 1898, p. 271.

Collected by E. W. Nelson at Pilitla, San Luis Potosi, Mexico. The umbilical region is pale lemon yellow. The rest varies from lemon yellow to deep orange, with a minute sculpture of small fine elevated threads which tend to break up into granules. U.S.N.M., 107823.

SIPHONARIA LINEOLATA Orbigny.

Plate XXVIII, figs. 10, 13.

Siphonaria lineolata ORBIGNY, Moll. Cubana, I, 1842, p. 232, pl. xvii, figs. 13, 15.

Siphonaria naufragum STEARNS, Proc. Boston Soc. Nat. Hist., XV, 1872, p. 23.

Cuba, Orbigny; St. Augustine, Hemphill; Amelia Island, East Florida, Stearns; Jupiter Inlet, etc., Dall. U.S.N.M., 97267.

Whitish or brownish, with radiating blackish lines conspicuous internally, the radial sculpture always fine and close and the form very regular for a limpet. The name has been misprinted *lineata* by Beau and Krebs.

SIPHONARIA ALTERNATA Say.

Plate XXVIII, figs. 12, 14.

Patella alternata SAY, Journ. Acad. Nat. Sci. Phila., V, 1826, p. 215.

Siphonaria alternata SAY, Am. Conch., IV, 1826, pl. xxxviii.—BINNEY'S Say, p. 192.

Siphonaria brunnea (Hanley) JONES, Moll. Bermuda, Trans. Nova Scotian Inst., II, 1864, Pt. 2, p. 21.

? *Siphonaria picta* ORBIGNY (part), Moll. Cubana, I, 1842, p. 231.

East Florida, Bermuda, south to Cuba and west to Yucatan. U.S.N.M., 94431.

The figured specimen is from Bermuda, collected by Goode, and is what Jones referred to *S. brunnea* Hanley. It appears to be merely a better-nourished, slightly darker-colored geographical race of the *alternata* of Say. If the *S. picta* Orbigny (1842) comprises only a single species, which is not yet certain, this species extends southward to Rio Janeiro, Brazil. It is somewhat singular that no good figure of Say's shell is to be found in the whole conchological literature of America, though the shell has been known (chiefly by bleached, worn specimens) for three-quarters of a century.

EAST AMERICAN MARINE SPECIES.

CYLICHNA VERRILLII Dall.

Plate XXIX, fig. 1.

Cylichna verrillii DALL, Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, Jan. 1889, p. 54.

Collected off the coast of North Carolina at various stations in from 50 to 124 fathoms, sand, with the bottom temperatures from 58° to 75° F., by the U. S. Fish Commission steamer *Albatross*. Bluish white with a nearly translucent periostracum and finely spirally striated. U.S.N.M., 94477.

RETUSA MAYOI Dall.

Plate XXIX, fig. 2.

Utriculus mayoi DALL, Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, Jan., 1889, p. 46.

Collected from the stomach of a haddock at Portland, Maine, by Mr. John Mayo. U.S.N.M., 95269.

Shell solid, yellowish white, with little or no spiral striation.

UMBRACULUM (HYALOPATINA) RUSHII Dall.

Plate XXX, fig. 5.

Umbaculum (Hyalopatina) rushii DALL, Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, 1889, p. 61.—PILSBRY, Man. Conch., XVI, 1896, p. 185, pl. LI, fig. 58.

Dredged off Great Isaac Light, Bahamas, in 30 fathoms, sand, by Dr. W. H. Rush, U. S. N. U.S.N.M., 61222.

The shell is almost perfectly flat and very thin; bluish translucent white, dextral with a sinistral nucleus.

TEREBRA TEXANA Dall.

Plate XXIX, fig. 8.

Terebra texana DALL, Nautilus, XII, No. 4, Aug., 1898, p. 45.

From the Gulf coast of Matagorda Island, Texas, J. D. Mitchell. U.S.N.M., 107373.

Color pale yellowish, with darker yellow or brown flammules. Only two imperfect specimens of this fine species are known, both from the above locality.

TEREBRA (SUBULA) FLORIDANA Dall.

Plate XXIX, fig. 9.

Subula floridana DALL, Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, 1889, p. 63.

Terebra (Subula) floridana DALL, Bull. 37, U. S. Nat. Mus., 1889, p. 94.

Key West and Florida Strait, dredged by the U. S. Fish Commission steamer *Albatross* in 45 to 56 fathoms, sand. U.S.N.M., 87222. It is of a pale straw color.

TEREBRA (ACUS) RUSHII Dall.

Plate XXIX, fig. 6.

Terebra (Acus) rushii DALL, Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, 1889, p. 64.

Dredged 5 miles off Cape Florida, in 8 fathoms, by Dr. W. H. Rush, U. S. N. U.S.N.M., 82952.

It is a small, brilliantly white shell, remarkable for its exclusively spiral sculpture.

CONUS STIMPSONI, new species.

Plate XXIX, fig. 7.

Conus stimpsoni DALL, MS., in Coll. U. S. Nat. Mus.

Dredged by the U. S. Fish Commission steamer *Albatross*, in 60 fathoms, off Key West. U.S.N.M., 107371.

Shell of about twelve whorls, as figured, slopes of the spire somewhat concave, turreted, the nuclear whorl rounded, smooth; the following four furnished with a beaded keel at the shoulder; this keel becomes entire on the subsequent whorls; above the shoulder the whorls are slightly concave, the suture appressed, and there are about three faint spiral grooves on the concave surface; last whorl with shallow squarish channels, as figured. The periostracum is thin, pale straw color, finely axially striated. The color of the shell is pinkish white, suffused with salmon pink near the shoulder and on the spire and base, with a very faint, cloudy band of the same about midway between base and shoulder. Altitude of shell, 37 mm.

The species is named in honor of the late Dr. William Stimpson, whose last field work was done in the vicinity of the Florida Strait.

DAPHNELLA EUGRAMMATA, new species.

Plate XXIX, fig. 3.

Dredged at station 2328, off Habana, in 203 fathoms, bottom temperature 78° F., by the U. S. Fish Commission. U.S.N.M., 107448.

Shell small, yellowish white, with rather coarse spiral channels, separated by narrow, rounded threads crossed by narrow riblets, strong on the upper whorls, on the last fainter, extending axially from the broad concave fasciole to about the middle of the whorl, where they become obsolete, substantially as figured. Outer lip not lirate within, and no callus on the pillar. Altitude of figured type, 9 mm.; maximum diameter, 4 mm.

ADMETE MICROSCOPICA Dall.

Plate XXIX, fig. 4.

Cancellaria microscopica DALL, Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, 1889, p. 131.

Admete ? microscopica DALL, Bull. 37, U. S. Nat. Mus., 1889, p. 106.

Campeche Bank, off Yucatan; Florida Strait, and off Fernandina, Florida, in 200 to 780 fathoms, U. S. Fish Commission steamer *Albatross* and Dr. W. H. Rush. U.S.N.M., 82977.

The plaits on the pillar are either not fully developed, or, as seems more probable, are almost obsolete, as are the inner lirations of the outer lip. For this reason it seemed more appropriately placed in *Admete*, though the general appearance is more like that of *Trigonostoma* in miniature. The largest specimen observed measures only 4.3 mm. in length.

AURINIA DUBIA Broderip.

Plate XXIX, fig. 11.

Voluta dubia BRODERIP, Zool. Journ., III, 1828, p. 81, pl. iii, fig. 1.

Aurinia dubia DALL, Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, 1889, p. 151.

North Carolina to the Gulf of Mexico, in 34 to 168 fathoms. U.S.N.M., 54544.

Full synonymy and details of the gross anatomy will be found in the Blake report. The shell is so thin and fragile that it is probably always destroyed before reaching the beaches when cast up by the sea. The color is salmon pink with squarish dark brown spots, very much as in the case of *Scaphella junonia*. The figures of this species being hardly accessible to American students, it was thought desirable to provide one here.

MURICIDEA PHILIPPIANA Dall.

Plate XXIX, fig. 5.

Muricidea philippiana DALL, Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, Mar., 1889, p. 213.

Among coral at low water, at Key West, Hemphill, and off Cape Catoche, Yucatan, in 20 to 25 fathoms, coral sand, U. S. Fish Commission steamer *Albatross*. U.S.N.M., 93337.

This curious shell is of a bluish milky white suffused with pale violet or rose on the pillar or in the throat.

MURICIDEA (PSEUDONEPTUNEA) MULTANGULA Philippi.

Plate XXX, fig. 1.

Fusus multangulus PHILIPPI, Zeitschr. für Malak., V, 1849, p. 25.

Muricidea hemphilli DALL, Hemphill's Shells, 1883, p. 327.

Fusus (Pseudoneptunea) multangulus KOBELT, Jahrb. Malak. Ges., IX, 1882, p. 17.

From Cape Fear, North Carolina, to Florida; Yucatan, and the northern Antilles, in shallow water. U.S.N.M., 36030.

A very elegant shell when in fine condition, whitish with pale brown flecks, and often with rosy or purplish suffusion about the aperture. It has a fusoid operculum, and when perfect the very thin periostracum is slightly hispid.

MURICIDEA OSTREARUM Conrad.

Plate XXX, fig. 2.

Murex ostrearum CONRAD, Proc. Acad. Nat. Sci. Phila., III, 1846, p. 25.

Urosalpinx floridanus CONRAD, Am. Journ. Conch., V, 1869, p. 106, pl. XII, fig. 4.

Muricidea floridana DALL, Hemphill's Shells, 1883, p. 326; Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, 1889, p. 213.

Florida coast south from St. Augustine and west to Yucatan, low water to 13 fathoms, on rocky shores. U.S.N.M., 54491.

This species is of a grayish color with a livid purplish brown throat. It is rather similar to the *Urosalpinx perrugatus* Conrad, which is stouter, with two brown spiral bands usually visible in the throat, and has a quite different operculum.

LATIRUS CAYOHUESONICUS Sowerby and Melvill.

Plate XXX, fig. 6.

Latirus cayohuesonicus SOWERBY and MELVILL, Proc. Zool. Soc., 1878, p. 796, pl. XLVIII, fig. 4.

Key West and southward among the northern Antilles. U.S.N.M., 83635.

This small dark brown species appears to be rather rare.

SCALA NITIDELLA Dall.

Plate XXX, fig. 8.

Scala nitidella DALL, Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, Apr., 1889, p. 314.

Fifteen to 30 miles off the coast of North Carolina in about 50 fathoms, sandy bottom, U. S. Fish Commission steamer *Albatross*, and south to the Straits of Florida. U.S.N.M., 83716.

Brilliantly polished white, liberally blotched with cloudy spots of light brown disposed in an irregularly spiral manner along the whorl.

SCALA SCIPIO Dall.

Plate XXIX, fig. 10.

Scala scipio DALL, Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, Apr., 1889, p. 310.

Cape Hatteras, North Carolina, to Vera Cruz, Mexico, in 10 to 16 fathoms. U.S.N.M., 10694.

The species is characterized by its livid pink color, glistening surface, and white varices.

SCALA (AMÆA) MITCHELLI Dall.

Plate XXX, figs. 3, 4.

Scala mitchelli DALL, Nautilus, IX, No. 10, Feb., 1896, p. 112.

Matagorda Island, Texas, by J. D. Mitchell. U.S.N.M., 132788.

The shell is yellowish white, with the basal area and a band above the periphery dark reddish brown; the sculpture recalls *S. magnifica*.

SCALA (CIRSOTREMA) COCHLEA Sowerby.

Plate XXX, fig. 7.

Scalaria cochlea SOWERBY, Thes. Conch., *Scalaria*, 1847, p. 103, pl. xxxv, fig. 142 (only).

Scala (Cirsotrema) cochlea MÖRCH, Journ. Acad. Nat. Sci. Phila., VIII, 1876, p. 205.

Off Hatteras, North Carolina, in 124 fathoms, sand, and Gulf of Mexico, near Cedar Keys, in 25 fathoms; U. S. Fish Commission. In the West Indies, at St. Thomas, St. Croix, Santo Domingo, and Tortola (in mud, 1 to 2 feet of water, Swift). U.S.N.M., 93710.

This fine shell is of a whitish or slightly ferruginous color, with a black operculum. It reaches a length of over 40 mm. The specimen figured is from the northern part of the Gulf of Mexico. Sowerby's reference to Loanda, west coast of Africa, in connection with this species in the Thesaurus, is regarded by Mörch as an error, though it is included by Dunker in his catalogue of the Loanda collection of Tams.

SCALA (ACRILLA) RETIFERA Dall.

Plate XXX, fig. 9.

Scala (Acrilla) retifera DALL, Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, 1889, p. 312.

Off the coast of North Carolina, in 49 to 63 fathoms, bottom temperature 75° F. U.S.N.M., 83733.

The color of the shell is pale olive, grayish, or whitish, with a white callus on the inner lip.

PECTEN (PLAGIOCTENIUM) GIBBUS var. **AMPLICOSTATUS** Dall.

Plate XXXII, fig. 9.

Pecten gibbus var. *ampliocostatus* DALL, Trans. Wagner Inst., III, Pt. 4, 1898, p. 747.

Coast of Texas and south to Cartagena. U.S.N.M., 106990.

One valve is usually white, the other of a slaty gray, more or less variegated with white and brown.

LIMA (CTENOIDES) ALBICOMA Dall.

Plate XXXII, fig. 2.

Lima albicoma DALL, Rep. Blake Pelec., Bull. Mus. Comp. Zool., XII, No. 6, 1886, p. 225.

Off Habana in 115 fathoms, and at Barbados in 100 fathoms. U.S.N.M., 62250.

The color of the shell is grayish white, or with a slight tinge of yellow.

PHILOBRYA ATLANTICA Dall.

Plate XXXII, figs. 4, 5.

Philobrya atlantica DALL, Proc. U. S. Nat. Mus., XVIII, 1895, p. 16.—BERNARD, Journ. de Conchyl., XLV, 1897, p. 10, pl. I, fig. 2.Spirling Bay, Argentine coast, attached to algæ in 58 fathoms. U. S. Fish Commission steamer *Albatross*. U.S.N.M., 97057.

Bernard, in discussing this species, has not quite clearly understood my meaning, when, in my original paper, I compared the nepionic valves of this species to a Naiad glochidium. I did not mean that the *Philobrya* passed through an encysted stage in its early development necessarily, or that the development of the soft parts before the post-nepionic development of the shell was necessarily equivalent to that of the naiades, but merely that the nepionic stages of the valves were comparable, which is undoubtedly the case, though the resemblance may be less close than I was at first disposed to believe. The shell is of a purplish color, with an olivaceous periostracum, fimbriated on the radial lines, and the young are retained within the maternal shell until of a considerable size, this period, perhaps, corresponding to the period of encystment in the naiades.

CRENELLA PECTINULA Gould.

Plate XXXI, fig. 11.

Modiola pectinula GOULD, Inv. Mass., 1841, p. 127, fig. 85.*Modiolaria pectinula* GOULD, Otia, 1862, p. 182.*Crenella pectinula* STIMPSON, Checkl. East Am. Shells, p. 2, Smithsonian Misc. Coll., 1860.

In codfish stomachs taken on Georges Banks, Gould; Gulf of St. Lawrence, Whiteaves. U.S.N.M., 64097.

Shell of a bright yellow brown with about forty not very close set, rounded ribs, sometimes with a fine intercalary thread, the interior nacre white or slightly bluish.

CRENELLA FABA Müller.

Plate XXXI, fig. 12.

Mytilus faba MÜLLER, Prodr. Zool. Danica, 1776, p. 250, No. 3015.—FABRICIUS, Fauna Grönl., 1780, p. 419.

Greenland and adjacent Arctic seas, Fabricius and others; Labrador, Turner; Straits of Belle Isle, Packard; and Mingan, Whiteaves. U.S.N.M., 107638.

Shell of a dark livid purple-brown externally, with about seventy low, flat radial riblets without intercalary threads; the interior nacre deep purple. I regard this as distinct from *C. pectinula* on account of the differences in color and sculpture; it is also rather less inflated than the latter.

ARCA (FOSSULARCA) ADAMSI Smith, var. CONRADIANA Dall.

Plate XXXI, fig. 1.

Arca adamsi var. *conradiana* DALL, Rep. Blake Pelec., Bull. Mus. Comp. Zool., XII, 1886, No. 6, p. 243.

Off Cape Hatteras, North Carolina, and southward to the Gulf of Mexico and Curaçao. U.S.N.M., 92553.

The shell is of a yellowish white color.

ARCA (CUCULLARIA) SAGRINATA Dall.

Plate XXXI, fig. 2.

Macrodon sagrinata DALL, Rep. Blake Pelec., Bull. Mus. Comp. Zool., XII, 1886, No. 6, p. 245.

Arca (Cucullaria) sagrinata DALL, Trans. Wagner Inst., III, 1898; Pt. 4, p. 659.

Gulf of Mexico, in 80 fathoms. U.S.N.M., 63175.

ASTARTE GLOBULA Dall.

Plate XXXII, fig. 6.

Astarte smithii var. *globula* DALL, Rep. Blake Pelec., Bull. Mus. Comp. Zool., XII, 1886, No. 6, p. 260.

Off Fernandina, Florida, in 294 fathoms, and in the Antillean region from Barbados westward to Campeche Bank, in 50 to 539 fathoms. U.S.N.M., 87722.

The shell is smooth, not vernicose, and of a pale brown or straw color.

CHAMA LACTUCA Dall.

Plate XXXI, figs. 8, 10.

Chama lactuca DALL, Rep. Blake Pelec., Bull. Mus. Comp. Zool., XII, 1886, No. 6, p. 260.

Dredged by the U. S. Coast Survey Steamer *Hassler* at Barbados in 80 to 100 fathoms. U.S.N.M., 64305.

The shell is of a whitish color with concentric bands of ruddy brown, capuliform and thin; the nepionic shell is claret colored and polished.

This species has the same capuloid form as the *C. nicolloni* Dautzenberg, from the Atlantic coast of France in about 65 fathoms; but the latter, which was described in 1893, has broad concentric frills on both valves whereas the present species has fluted sculpture on the upper, and concentric laminae only on the lower valve.

AGRIOPOMA new section.**MERETRIX (AGRIOPOMA) TEXASIANA** Dall.

Plate XXXII, fig. 1.

Cytherea texasiana DALL, Nautilus, V, 1892, No. 12, p. 134.

Coast of Texas at Galveston and elsewhere. U.S.N.M., 6056.

Shell white or creamy with a dull surface, rather rudely striated in harmony with the incremental lines.

This resembles *M. sayana* Conrad (= *convexa* Say) in a general way, but is more elongated and grows to a far larger size. They belong in the same section of the genus characterized by the colorless shell and the rude external sculpture for which (as it does not seem to have been differentiated hitherto and is perfectly distinguished from the original *Callista* by its superficial characteristics) I propose the sectional name of *Agriopoma*.

MERETRIX (TRANSENNELLA) CONRADINA Dall.

Plate XXXI, figs. 5, 7.

Cytherea (Transennella) conradina DALL, Proc. U. S. Nat. Mus., VI, Dec., 1883, p. 340.

In mud between tides at Cedar Keys on the west coast of Florida, Hemphill; south to Key West and north along the Atlantic coast to Cape Hatteras. U.S.N.M., 91993.

The shell is white with fine zigzag markings of pale yellow in some specimens and occasionally a pink suffusion internally. It belongs to a little group of *Veneridæ* which appears to be restricted to tropical and subtropical east American waters and recalls *Psephis* of the Pacific coast. They are all of small size but do not appear to be viviparous like *Psephis*, and are especially characterized by the singular system

of grooves on the internal margins of the valves. These grooves are subconcentric but cut the margins more or less obliquely, not in harmony with the lines of growth. The same type occurs in our southern tertiaries, and an attempt is made in fig. 7 to illustrate this system of marginal grooving.

MERETRIX SIMPSONI Dall.

Plate XXXII, fig. 3.

Cytherea simpsoni DALL, Bull. 37, U. S. Nat. Mus., 1889, p. 56 (name only);
Nautilus, IX, 1895, No. 1, p. 10.

Tampa, Florida, Charles T. Simpson; Sarasota Bay, Hemphill.
U.S.N.M., 53792.

Shell with narrow, slightly irregular and feeble concentric ridges, surface not polished except over the large ovate lunule which is smooth. Colors white or more or less suffused with purple which may be very dark internally, a zigzag pattern of yellowish brown frequently present; pallial sinus ascending, rather large and rounded in front; margins entire; escutcheon not delimited. Lon. 16.5; alt. 15.0; diam. 8.5 mm. The shell is rather solid and the periostracum thin and translucent.

MACTRA RICHMONDI Dall.

Plate XXXI, fig. 6.

Mactra richmondi DALL, Nautilus, VIII, 1894, No. 3, pp. 26, 28.

Grey Town, Nicaragua, C. W. Richmond. U.S.N.M., 124774.

The single valve obtained is white but may be somewhat bleached.

MACTRELLA IHERINGI Dall.

Plate XXXII, fig. 8.

Mactrella iheringi DALL, Nautilus, X, 1897, No. 11, p. 123.

San Paulo, Brazil, Ihering. U.S.N.M., 107632.

The shell is white with a yellowish silky periostracum and may reach nearly 3 inches in length.

ASTHENOTHÆRUS HEMPHILLI Dall.

Plate XXXI, fig. 9.

Asthenothærus hemphilli DALL, Rep. Blake Pelec., Bull. Mus. Comp. Zool., XII, 1886, No. 6, p. 308.

West of Florida in 17 fathoms; Marco, Florida, in 2 fathoms, Hemphill. U.S.N.M., 53691.

Small, yellowish white, with the aspect of a very young *Periploma*.

PANDORA (KENNERLEYIA) BUSHIANA Dall.

Plate XXXI, fig. 3.

Pandora (Kennerleyia) bushiana DALL, Rep. Blake Pelec., Bull. Mus. Comp. Zool., XII, 1886, No. 6, p. 312.

Tampa, Florida, in 6 fathoms, Charles T. Simpson. U.S.N.M., 61029. The shell is white externally and very perlaceous within.

PANDORA (CLIDIOPHORA) TRILINEATA Say.

Plate XXXI, fig. 4.

Pandora trilineata SAY, Journ. Acad. Nat. Sci. Phila., II, p. 261; Am. Conch. 1830, Pt. 1, pl. II.

Great Egg Harbor, New Jersey, and south to the Gulf of Mexico, Say; Cape Hatteras to West Florida, Dall. U.S.N.M., 61028.

The figured specimen is from Tampa Bay, Florida, in 6 fathoms. The species has been generally confounded by the northern collectors with the following one. The shell is white, often with a ferruginous deposit near the hinge line, and, like the other species of the genus, brilliantly nacreous internally.

PANDORA (CLIDIOPHORA) GOULDIANA Dall.

Plate XXXII, fig. 7.

Pandora (Clidiophora) gouldiana DALL, Rep. Blake Pelec., Bull. Mus. Comp. Zool., XII, 1886, No. 6, p. 312 (footnote).

Nova Scotia south to Virginia, in shoal water to 30 fathoms. U.S.N.M., 95490, from Woods Hole, Massachusetts, Dall.

This large and rude species has generally been confounded by New England collectors with the more delicate and elegant Southern shell.

WEST AMERICA MARINE SPECIES.

CEPHALOPODA.**ARGONAUTA EXPANSA** Dall.

Plate XXXIII, figs. 1, 2, 3.

Argonauta expansa DALL, Proc. Cal. Acad. Sci., IV, Dec., 1872, p. 303.

Gulf of California, various collectors. U.S.N.M., 61369.

This fine and very distinct species of argonaut has a finely granular surface, with a generally yellowish white coloration, dark burnt brown color on the spines and part of the spire, and a livid brown-purple suffusion on the two long axial expansions. It appears to be abundant in the Gulf, and I have never seen a specimen from any other region. It has never been figured hitherto, and while a colored plate is required to fully exhibit its distinctive characters, I have thought that the figures now provided might aid in its recognition.

GASTROPODA.

Genus ACTÆON Montfort.

Subgenus MICROGLYPHIS Dall, 1902.

ACTÆON (MICROGLYPHIS) BREVICULUS, new species.

Shell small, short, plump, yellowish white, with four and a half polished whorls; nucleus sinistral but wholly immersed, so that the apex seems as if dextral, smooth; whorls convex, rapidly increasing, separated by a deep, almost channeled, very narrow suture; sculpture of extremely faint, fine spiral striæ almost absent in front of the suture and growing more distinct anteriorly, not visibly punctate; aperture ample, outer lip simple, body with a well-marked callus, continued on to the pillar and spreading a little over the base behind the pillar, which is concavely arcuate, its anterior edge thickened and expanded into a strong spiral plait or lamina behind which on the pillar is a second less marked plait; in front of the pillar is a small but distinct notch; lon. 3.6; max. diam., 2.25 mm.

Dredged off Santa Rosa Island, California, in 53 fathoms, sandy mud, at station 2902, by the U. S. Fish Commission steamer *Albatross*; bottom temperature, 45° F. U.S.N.M., 109042.

This little species belongs to a group of chiefly deep water Actæons, characterized by a very short spire and globose shell in which the end of the pillar is not only truncate as in *Rictaxis*, but has a marked sulcus behind it and is produced laterally into a rather wide spiral flange at maturity, and is concave with a single feeble plait behind the terminal lamina. Of these, *A. perconicus* and *A. curtulus* Dall may be mentioned, the latter, from the western part of Magellan Strait, may serve as type for the group which may be regarded as a subgenus of *Actæon* and take the name of *Microglyphis*. The present species is distinguished from *A. curtulus* by its somewhat more elongate form and much less obvious sculpture, beside being somewhat larger and less delicate.

TOLEDONIA, new genus.

Shell small, smooth, thin, imperforate, succineæform; pillar continuous with the basal margin of the aperture, straight, but with an elevated thin plait near the base of the pillar, which appears to be continued into the coil of the shell; nucleus smooth, dextral; soft parts unknown. Type, *T. perplexa* Dall.

This little shell has a combination of characters which prevent its being assigned to any known genus. It differs from any of the *Pyramidellidae* in its form and dextral nucleus; from the *Actæonidae* by its peculiar pillar and dextral nucleus; from immature *Ringicula* by its single plait and general aspect. It is not certain even to what

family of gastropods it should be assigned. As it was dredged at a considerable depth there seems no reason to doubt it is normally marine.

TOLEDONIA PERPLEXA, new species.

Shell small, whitish, smooth, except for faint incremental lines; suture distinct, whorls plump and rounded, the last comprising nearly the whole shell; nucleus smooth, polished, plump, dextral, of a single whorl; subsequent whorls three, smooth, inflated, slightly shouldered, with a distinct but not channeled suture; last whorl much the largest, surface slightly marked by incremental lines, not polished; periostracum, if any, lost; aperture ample, outer lip thin, simple, rounded in front and passing insensibly into the slightly oblique but not twisted pillar, with a thin callus on the body and over the imperforate umbilical region; plait thin, prominent, but not sharp, situated near the base of the pillar and apparently continued into the coil of the shell; alt. of shell 3.2; of aperture 2.2; max. diam. of shell 2.3 mm.

Dredged in the Straits of Magellan, east of Punta Arenas, by the U. S. Fish Commission steamer *Albatross* at station 2778, in 61 fathoms; bottom temperature 48° F. U.S.N.M., 109022.

The most striking features of this puzzling shell are its *Succinea*-like form and its untruncate straight pillar with a single prominent plait.

Genus **PLEUROTOMA** Lamarck.

Section **ANTIPLANES** Dall.

Among the deeper water and abyssal forms of this genus are some which do not seem to fit into any of the hitherto proposed sections. These forms are smooth except for incremental lines and sometimes fine spiral striæ, the periostracum is conspicuous and the shell disposed to be chalky, the anal sulcus shallow and more or less rounded, usually situated some distance from the suture, but not quite on the periphery of the whorl, the canal rather wide and long and often a little recurved, the aperture unarmed. There are both dextral and sinistral species, and I propose for them the sectional name of *Antiplanes*. The typical species will be *Surcula perversa* Gabb, of the California Tertiary and recent faunas.

PLEUROTOMA (ANTIPLANES) PERVERSA Gabb.

Plate XXXIV, fig. 8.

Pleurotoma perversa GABB, Proc. Cal. Acad. Sci., III, 1865, p. 183.

Drillia perversa GABB, Paleont. Cala., II, 1866, p. 6, pl. I, fig. 10.

Off San Pedro in 60 fathoms, Cooper; off Lower California in 48 fathoms, mud, U. S. Fish Commission steamer *Albatross*, at station 2934. The latter is figured here. Also in Pliocene and Pleistocene shell beds of San Pedro and San Diego, California. U.S.N.M., 122561.

The original figure of Gabb is very poor. I have figured a specimen, which has been compared with the original type of Gabb and found identical, for comparison with the following species.

PLEUROTOMA (ANTIPLANES) VINOSA Dall.

Plate XXXIV, fig. 4.

Pleurotoma vinosa DALL, Proc. Cal. Acad. Sci., V, 1874, p. 253.

Kyska Harbor, Great Kyska Island, Aleutian chain, and in 17 fathoms, Bristol Bay, Bering Sea, at station 3246, by the U. S. Fish Commission steamer *Albatross*. The latter figured. U.S.N.M., 122575.

PLEUROTOMA (ANTIPLANES) PIONA, new species.

Shell solid, heavy, with a rapidly tapering spire of seven or more rotund whorls separated by a distinct suture; nucleus eroded; surface covered with a brown periostracum, smooth except for fine obscure feeble spiral lines and the lines of increment; aperture short, rounded ovate with a short wide slightly recurved canal; pillar solid, white, twisted, obliquely truncate in front; outer lip with a shallow anal sinus a little in front of the suture; margin thin, simple. Lon. of shell 41, of aperture 19; max. diam. 18 mm. Operculum normal, brown.

Type specimen dredged by U. S. Fish Commission at station 3644, in 96 fathoms, sand; bottom temperature 33° F. U.S.N.M., 109179.

Range from 41 to 81 fathoms in the southern part of Bering Sea, and in from 41 to 110 fathoms south of Alaska peninsula, in the Pacific.

A fine solid dextral species, not particularly attractive, but with a certain symmetry of form. The two following are also dextral.

PLEUROTOMA (ANTIPLANES) THALÆA, new species.

Shell solid, heavy, with an elongate spire constricted at the sutures, and eight or more whorls; nucleus eroded; surface covered with a pale apple green periostracum, which fades in time to a greenish gray; surface sculptured only by incremental lines, faint spiral lines, a slight depression of the anal fasciole, and irregular, feeble, broken, short elevated lines which are scattered over the surface and usually directed at right angles to the incremental lines; aperture short and narrow, with a short and wide canal; outer lip with a deep anal sinuosity, leaving a slightly depressed fasciole behind it; anterior part of the outer lip much produced and rounded, thin and simple; pillar stout, white, short, obliquely truncate in front; canal wide, short, slightly flaring; base somewhat constricted, with the spiral striæ stronger than on the rest of the surface. Lon. of shell 40, of aperture 15; max. diam. 12 mm. Operculum normal.

Type specimen dredged off San Luis Obispo, California, by the U. S. Fish Commission steamer *Albatross* at station 3195, in 252 fathoms, mud; bottom temperature 43° 2 F. U.S.N.M., 122568.

Range, from the above locality northward to Bering Sea, being obtained off the Oregon coast in 277 fathoms, and at Unalaska in 68 to 85 fathoms.

This elegant species belongs to the same group as the preceding, and is notable for its numerous rounded whorls and deeply constricted suture, and when fresh for its peculiar pale green color, which fades in a few years, in the cabinet, to a greenish gray.

PLEUROTOMA (ANTIPLANES) SANTAROSANA, new species.

Shell elongated, slender, acute, with twelve whorls, of an olivaceous or pinkish brown; the interior of the aperture of a pale rufescent hue; whorls rounded, suture very distinct, sculpture chiefly of incremental lines and a faint spiral striation mostly below the periphery; anal fasciole limited by slightly raised lines; nucleus small, inflated, smooth; aperture narrow, with a short wide canal; pillar solid, short, obliquely truncate; outer lip thin, produced, with a deep anal sulcus a little in advance of the sutural margin of the whorl. Operculum normal. Lon. of shell 36, of aperture and canal 11.5; max. diam. 9 mm.

Dredged off Santa Rosa Island, California, in 53 fathoms, sand, at station 2902, by the U. S. Fish Commission steamer *Albatross* in 1889; bottom temperature 45° F. U.S.N.M., 109198.

This elegant species is the most slender and elongated of the group, so far as yet known, and is easily distinguished by that character and by the number of its whorls from any of the others.

PLEUROTOMA CIRCINATA Dall.

Plate XXXVI, fig. 1.

Pleurotoma circinata DALL, Proc. Cal. Acad. Sci., V, April 1873, p. 62, pl. II, fig. 5—AURIVILLIUS, Vega exp. vet. arb., IV, 1885, p. 353, pl. XIII, figs. 1, 2.

Mangilia (Aforia) circinata DALL, Rep. Blake Gastr., Bull. Mus. Comp. Zool., XVIII, Feb. 1889, p. 99.

Pleurotoma insignis JEFFREYS, Ann. Mag. Nat. Hist. for Aug., 1883, p. 120.

Captains Bay, Unalaska, in 60 fathoms, Dall; northwestern part of Bering Sea in 55 fathoms, Vega expedition. U.S.N.M., 108995.

This fine species was first figured from a more or less defective specimen, but has since been obtained in considerable numbers, living. It is not known from north of Bering Strait, though Jeffreys referred it to the Icy Sea of Siberia. The Vega specimens were dredged southwest of St. Lawrence Island, Bering Sea, in latitude 62° 39' and west longitude 177° 05'. Jeffreys was mistaken in supposing it to be inoperculate.

PLEUROTOMA CALLICESTA, new species.

Shell small, subelongate, with the aperture shorter than the spire, and six or more whorls; white, covered with a pale olive green

periostracum; nucleus, and possibly a whorl or two more, eroded; subsequent whorls somewhat irregular, moderately convex, with a well-marked suture bordered in front by a narrow turgid band, in front of which again is a shallow rounded anal sulcus which does not leave a well-marked fasciole, and is a good deal nearer to the suture than to the periphery; in front of the fasciolar region are a series of 12 or 13 short ill-defined ribs with equal or wider interspaces, becoming obsolete at the periphery, and which are proportionately sharper on the earlier whorls; incremental lines rather prominent and irregular, the surface also sculptured with a singular oblique arrangement of small loops and furrows obliquely irregularly disposed, recalling the pattern familiar on bookbinders' "combed" marble paper, but less regular, which covers the whole shell; pillar a little twisted, straight, obliquely attenuated in front, without any marked callus; canal short, wide, somewhat recurved; outer lip convexly arcuate, thin, sharp; there is a slight thickening on the middle of the pillar, which in the interior of the shell may develop into something more prominent. Lon. of shell (eroded) 19.3, of aperture 9.0; max. diam. 7.6 mm.

Dredged off Acapulco, Mexico, in 660 fathoms, ooze, by the U. S. Fish Commission steamer *Albatross* at station 3418; bottom temperature 39° F. U.S.N.M., 109030.

This elegant little shell has a sculpture quite unique, as far as I know. The animal has retracted so far that I can not tell whether it is operculate or not, but believe it may be so. As there is only one specimen and the surface is eroded in spots, I am unable to settle the question by having a section made, and the same difficulty prevents an investigation into the armature of the pillar, if any exists.

DRILLIA EMPYROSIA Dall.

Plate XXXIX, fig. 5.

Drillia empyrosia DALL, Nautilus, XII, No. 11, Mar., 1899, p. 127.

Off San Pedro, California, in 20 to 50 fathoms; Oldroyd.

The shell is yellowish with a burnt sienna brown tint on the later whorls; a paler peripheral band develops white patches where it crosses the ribs. Numerous fine specimens have since been dredged by the party belonging to the summer laboratory of the University of California, at San Pedro.

CANCELLARIA MIDDENDORFFIANA Dall.

Plate XXXVIII, fig. 6.

Admete middendorffiana DALL, Proc. U. S. Nat. Mus., 1884, p. 524; 1886, p. 297.

North end of Nunivak Island, Bering Sea, Dall. U.S.N.M., 108972. This fine and rare species has hitherto been unfigured.

SCAPHELLA STEARNSII Dall.

Plate XXXV, fig. 4.

Voluta (Scaphella) stearnsii DALL, Proc. Cal. Acad. Sci., IV, Oct., 1872, p. 270, pl. 1, fig. 1.

Shumagin Islands, Alaska, and westward to Captains Bay, Unalaska, in 40 to 100 fathoms. U.S.N.M., 91352.

The original figure of this species is not very accessible and was made from a rather imperfect specimen, hence I have figured a characteristic individual.

This fine species is separated by several thousands of miles from its nearest congener, and is perfectly distinct from any other. The purplish inner layer covered by a porcellaneous bluish-white outer stratum is not paralleled among the volutes. Yet with astonishing absurdity it has been united with *Scaphella ancilla* of the opposite end of the world by a conchologist of some note, who, it is charitable to suppose, has never seen a specimen.

FUSUS ? (ROPERIA) ROPERI Dall.

Plate XXXIV, fig. 3.

Fusus (Roperia) roperi DALL, Nautilus, XII, May, 1898, p. 4.

San Pedro, California, in rather deep water, E. W. Roper. Also fossil in the Pleistocene of San Pedro, Arnold. U.S.N.M., 151735.

This singular species is of a ferruginous brown, with the pillar and throat whitish, and with narrow brown spiral lines showing on the interior margin of the outer lip.

Family BUCCINIDÆ.

Subfamily BUCCININÆ.

BUCCINUM ANGULOSUM Gray.

Plate XXXVII, figs. 1, 2, 3, 6.

Buccinum angulosum GRAY, Zool. Beechey's Voy., 1839, p. 127, pl. xxxvi, fig. 6.—

DALL, Rep. Int. Polar Exp. to Point Barrow, Alaska, 1885, p. 179, figs. 1-4.

Buccinum stimpsoni GOULD, Proc. Bost. Soc. Nat. Hist., VII, 1860, p. 325.

Shores of the Polar Sea near Bering Strait, Beechey; Point Barrow and Cape Smythe, low water to 5 fathoms, Murdoch. U.S.N.M., 40966, 40967, 122555.

The Point Barrow report is not generally accessible, and, though it contains excellent figures of several of these arctic *Buccinums*, with magnified drawings of the minute sculpture of their surfaces, so important for identification, I have thought it desirable to refigure several of them here. Most of these arctic *Buccinums* have two forms apparently correlated with sex, the males being in several species far

smaller, more slender, and less shouldered and flaring at the aperture. That the female has to carry the material for the enormous ovicapsular mass is a sufficient reason for this difference in form and probably for the difference in size. Apart from this, many of the species have mutations of the coarser sculpture, which result in very unlike individuals. They may be (1) rotund without strong keels or ribs, a state which I have called the normal form; (2) with strong spiral keels; (3) with strong axial ribs but no keels; (4) with both ribs and keels. I have enlarged on this subject elsewhere,¹ and will not repeat the discussion here, but I may note that the males are relatively few in number, and it has been noted by Morse that they hide in rocky crevices too small to be entered by the females. At a time when the latter are on the sand beaches ovipositing the collector would probably find no males with them at all.

On Plate XXXVII will be found illustrated several of the forms referred to. Fig. 3 represents Gray's *angulosum*, a female which is the form named *stimpsoni* by Gould, strongly keeled and ribbed. Fig. 6, variety *normale* Dall, without keels or ribs, a male specimen. Fig. 2 represents a male of the type which carries ribs but no keels, and which in the Point Barrow report I called variety *subcostatum*. This specimen is not quite mature and has not formed the reflected lip. Lastly, fig. 1 represents a female specimen which has a distinct keel, but only faint wrinkles in place of ribs. In like manner fig. 7 represents the normal form of *Buccinum castaneum* Dall, and fig. 9 the carinate form, both being females. The latter when young has an astonishing resemblance to a young *Chrysodomus liratus*.

In some species I suspect the discrepancy between the sexes is less noticeable, but in a keg of some 200 *B. hydrophanum* Hancock, from Baffin Bay, there were only nine males, all dwarfish.

BUCCINUM PERCRASSUM Dall.

Plate XXXVII, fig. 4.

Buccinum (*polare* var. ?) *percrassum* DALL in Mart. u. Chemn. Conch. Cab. neue ausg., *Buccinum* (Kobelt), 1883, p. 86, pl. xci, fig. 5 (not of Posselt, 1898).

Buccinum percrassum DALL, Proc. U. S. Nat. Mus., 1886, p. 216.

Bering Island, Bering Sea, Grebnitzki. U.S.N.M., 108997.

This remarkably solid species has an exceptionally large lozenge-shaped operculum. The specimen figured by Kobelt was of the type with small keels and riblets; that now figured is the normal form. The minute sculpture is quite distinct from that of *B. ochotense* Middendorff (*B. schrenckii* Verkrusen), which is also a rather solid species. It is nearest related to *B. polare* Gray, but I have not found yet any intermediate specimens.

¹ Nachrichtenblatt d. d. Malak. Ges., 1882, pp. 118-121.

BUCCINUM PLECTRUM Stimpson.

Plate XXXVII, fig. 5.

Buccinum plectrum STIMPSON, Rev. North. Bucc., Can. Nat. for 1865, p. 374.—
KOBELT, Conch. Cab. *Buccinum*, p. 83, 1883, pl. xci, fig. 2.

Bering Strait, in 25 to 30 fathoms, Stimpson; shores of Bering Sea and the Aleutian Islands, Dall. U.S.N.M., 34232.

The specimen figured by Kobelt being imperfect and not very characteristic, I have represented a fine specimen from Kadiak Island, Alaska, no figure being accessible in any American publication.

BUCCINUM CASTANEUM Dall.

Plate XXXVII, figs. 7, 9.

Buccinum castaneum DALL, Proc. Cal. Acad. Sci., VII, 1877, p. 3.—KOBELT, Conch. Cab. *Buccinum*, p. 84, 1883, pl. xci, fig. 3.

Shumagin Islands, Alaska, in 20 fathoms, Dall (normal form); western Aleutian Islands in 5 fathoms, Dall (var. *tricarinatum*). U.S.N.M., 108973, 108974.

I give figures of the two types of this species already referred to under *B. angulosum*.

This species has a translucent brown outer coat with fine uniform spiral striation.

BUCCINUM TENELLUM Dall.

Plate XXXIX, fig. 9.

Buccinum tenellum DALL, Conch. Cab. neue ausg. *Buccinum*, 1883, p. 88, pl. xci, fig. 8.

Cape Etolin, north end of Nunivak Island, Bering Sea, Dall. U.S.N.M., 108975.

Shell small, solid, with about six whorls, a rather acute spire, very distinct suture, below which the whorl is pinched or puckered into short inconspicuous ribs; surface brownish yellow with a spiral sculpture of small flat riblets separated by incised lines, the riblets themselves finely uniformly spirally striated; canal short, recurved; siphonal fasciole strong, pillar lip callous, the outer lip expanded, sinuous, not much thickened. Alt., 22.25 mm.

Though not exhibiting any very striking features, this little shell does not fit in with any of the other species of the region well enough to permit it to be united specifically. The figure in the Conchylien Cabinet was not accompanied by a diagnosis, which I now provide.

BUCCINUM PICTURATUM Dall.

Plate XXXVII, fig. 8.

Buccinum picturatum DALL, Proc. Cal. Acad. Sci., VII, Mar., 1877 (p. 3 of extras), p. 8; Conch. Cab. neue ausg. *Buccinum*, 1883, p. 60, pl. LXXXV, fig. 7.

Aleutian Islands; the figured type from Kyska Harbor, Kyska Island, Dall. U.S.N.M., 108976.

The shell is of a cream color with pale brown flammulation which is apt to fade in cabinet specimens and is not represented on the figure of the type, but when the shells are fresh is of a lively color. *B. finmarkianum* Verkrutzen, from the northern coast of Norway, is similarly painted but differently sculptured.

Subfamily CHRYSODOMINÆ.

Genus CHRYSODOMUS Swainson.

- Murex* (sp.) LINNÆUS, Syst. Nat., 10th ed., 1758, p. 754.
Fusus (sp.) BRUGUIÈRE, Encyc. Mèth., I, 1789, p. xv, pl. cccxxxvi.
Rhombus (sp.) HUMPHREY, Mus. Calonnianum, 1797, p. 33.
Neptunea (sp.) BOLTEN, Mus. Boltenianum, 1798, p. 115; LINK, Besch. Rostock Samml. III, 1807, p. 117.
Chrysodomus SWAINSON, Malac., 1840, pp. 90, 308; type, *Murex antiquus* Linnæus.
 Not *Chrysodomus* G. O. SARS, Moll. Reg. Arct. Norv., 1878, p. 269 (= *Beringius* Dall).
Atractus AGASSIZ, Min. Conch., German ed., 1840, p. 44; types, *Murex striatus* (= *antiquus* Linnæus) and *M. contrarius* Gmelin; not *Atractus* Wagler, 1828.
 > *Tritonofusus* BECK, Amtl. Ber. d. 24 Vers. deutsch. Naturf., Kiel, 1847, p. 114 (type, *Fusus islandicus* Chemnitz); HERRMANNSEN, Ind. Gen., ii, 1849, p. 611.
 > *Sipho* MÖRCH, Cat. Yoldi, 1852, p. 104 (examples *Fusus islandicus* Chemnitz and *F. ventricosus* Gray); not *Sipho* Brown, Ill. Conch., 1827, pl. xxxvi, nor *Fabricius*, 1823.
Neptunea MÖRCH, Cat. Yoldi, 1852, p. 104 (first species *Murex antiquus* Linnæus; no diagnosis given).
 < *Fusus* MÖRCH, Fort. ov. Grönl. Blöddyr, 1857, p. 13.
 > *Tritonofusus* MÖRCH, Fort. ov. Grönl. Blöddyr, 1857, p. 13; not of Beck, 1847.
 > *Siphonorbis* MÖRCH, Journ. de Conchyl., XVII, 1869, p. 397 (first species *Fusus lachesis* MÖRCH).
 > *Tritonellium* VALENCIENNES, Comptes Rendus, XLVI, 1858, p. 762 (*T. barthi* Valenciennes).
 > *Neptunella* VERRILL, Inv. An. Vineyard Sound, 1873, p. 639; Am. Journ. Sci., 3d ser., VI, 1873, p. 439. (Type, *Fusus pygmaeus* Gould). Not *Neptunella* Meek, 1864.
 > *Siphonella* VERRILL, Checkl. Mar. Inv. Atlantic Coast, 1879, p. 20 (new name for *Neptunella*, preoccupied); not *Siphonella* Hagen, 1851.

The names *Murex*, *Fusus*, *Rhombus*, *Neptunea*, stood in early literature for a heterogeneous mixture of Prosobranchiate gastropods, and the last three were practically synonyms of each other. Humphrey's anonymous catalogue, without diagnoses or references to literature except the almost equally barren Portland catalogue, I have always rejected as not properly entering into scientific synonymy, although

the names have to be cited historically. Any other course would result in upsetting many of the best-established names of molluscan genera and families with nothing but detriment to science. Bolten's names, having proper references to the literature, do not stand on the same footing, but his *Neptunea* was a heterogeneous assembly containing much such a mixture as *Fusus* Bruguière, with no type selected.

The recognizable contents of *Neptunea* Bolten include the following genera, which I give in the order in which they have been diagnosed by other authors: *Nassa* (*reticulata*) Lamarck, 1799; *Nassaria* (*nivea*) Link, 1807; *Trophon* (*magellanicus*) Montfort, 1810; *Monoplex* (*caudatus*) Perry, 1811; *Lampusia* (*rubecula*) and *Melongena* (*corona*) Schumacher, 1817; *Chrysodomus* (*antiquus* and *contrarius*) Swainson, 1840; *Boreotrophon* (*clathrus*) Sars, 1878. So it appears that, even if we disregard the absence of a diagnosis and proceed by the method of elimination, the present group would not be entitled to the name of *Neptunea*. Link, in 1807, gave a diagnosis and divided *Neptunea* into two unnamed groups, one equivalent to *Nassa* Lamarck, and the other containing the larger forms, with which he included the broad Fasciolarias like *F. trapezium*.

The genus *Atractus* Agassiz is an exact synonym of *Chrysodomus*, and the name had been used for Reptiles in 1828, and Insects in 1833.

Beck, in 1847, proposed the name of *Tritonofusus* for the elongated forms like *C. islandicus*, for which Mörch, in 1852, attempted to revive the nonbinomial *Sipho* of Klein, which in binomial nomenclature was already utilized by Brown. In 1858 Valenciennes proposed to substitute for *Tritonium* Müller, as applied to these forms, the name *Tritonellium*, which is superfluous.

For another group of this subfamily Gray, in 1857 (January), proposed the name *Strombella* with a diagnosis. *Strombella*, as a nude catalogue name, had been published by Schlueter, in 1838, covering a number of species of *Strombus* like *S. pugilis*, which are of smaller size than those he regarded as typical. I have regarded this name as not having entered into nomenclature, and therefore not preventing the adoption of Gray's genus; but the present usage seems to be adverse to this view, and therefore I now revert to the name *Volutopsius* of Mörch of nearly even date, but which (emended to *Volutopsis*) was adopted by G. O. Sars in 1878 and properly defined. The synonymy of this genus is as follows:

Genus VOLUTOPSIUS Mörch.

- Strombella* GRAY, Guide Moll. Brit. Mus., 1857, p. 13 (January, type, *Fusus norvegicus* Chemnitz), not of SCHLÜTER, System. Conchyliensamml., 1838, p. 22.
Volutopsius MÖRCH, Fort. ov. Grönl. Blöddyr, April, 1857, p. 13, and Arctic Manual, 1875, p. 129 (same type).
Volutopsis DALL, Proc. Cal. Acad. Sci., V, 1873, p. 57—G. O. SARS, Moll. Reg. Arct. Norv., 1878, p. 268.

- > *Pyrolufusus* (Beck, MS.) MÖRCH, Annales Soc. Mal. de Belgique, IV, 1869, p. 20 (no diagnosis, sole example cited, *Fusus deformis* Gray).
> *Heliotropis* DALL, Proc. Cal. Acad. Sci., V, April, 1873, p. 61. (Type, *Neptunea harpa* Mörch.)

Subdivisions of this subfamily may be characterized as follows:
Genus **Chrysodomus**. Type, *C. antiquus* (Linnæus).

Shell large, short-fusiform, smooth or spirally sculptured, sometimes with rude axial ribbing or nodosities; outer coat of the shell subtranslucent, with a darker tint than the inner layers and with the periostracum inconspicuous; last whorl longer than the spire, with a wide aperture, the outer lip flaring or subreflected; pillar flexuous, smooth; body without callosities or liræ; the canal rather long, wide, and flexuous; animal short and broad, the penis large, usually sickle-shaped and with a small elongated terminal papilla; operculum ovate with apical nucleus, nearly closing the aperture; ovicapsules massed, either in a heap, as in *Buccinum*, or in a cylindrical erect group. The nepionic shell with a rounded, irregular submamillary nucleus and rapidly increasing subsequent whorls. The dental formula is 1·1·1, the teeth usually tridentate, the central rhachidian cusp and outer lateral cusps usually larger, the minor cusps often irregular, multiple, or obsolete. The habitat of the genus is in cold water of the north temperate or Arctic seas.

Genus **Ecphora** Conrad, 1843. Type, *Fusus quadricostatus* Say, 1824. Miocene of Maryland. Shell vertically depressed, few whorled, the last much the largest; canal short, very deep and narrow with a funicular large umbilical pit; sculpture of strong spiral ribs.

I have already shown¹ that this curious shell is probably closely related to *Chrysodomus*.

Genus **Tritonofusus** Beck. Type, *Fusus islandicus* (Gronovius).

Shell usually smaller than *Chrysodomus*, elongate-fusiform, smooth or spirally sculptured, axial sculpture feeble or none; outer layer of the shell chalky, white, with a conspicuous, often villous periostracum; aperture moderate, with the outer lip acute, entire, not reflected or flaring; canal narrow, elongate, and more or less flexuous; pillar and body smooth; operculum filling the aperture, formed as in *Chrysodomus*; ovicapsules solitary, lentiform or hemispherical, attached by the whole flat side; nepionic shells small, the apical whorl swollen, subglobular, the next succeeding somewhat constricted, and the rest regularly increasing. Dentition as in *Chrysodomus*, the minor cusps variable.

Subgenus **Siphonorbis** Mörch (*Siphonella* Verrill). Type, *Fusus lachesis* Mörch.

Rhachidian tooth with a single cusp, and laterals with two cusps; nepionic shell beginning with a small regular planorboid coil and the

¹ Trans. Wagner Inst., III, 1890, p. 124.

subsequent whorls regularly increasing; otherwise as in *Tritonofusus* s. s.

Subgenus **Plicifusus** Dall, 1902. Type, *Fusus kroyeri* Møller.

Shell solid, usually with developed axial ribs and feebler spiral sculpture; the aperture expanded and with a wide insinuation behind on the outer lip; canal usually short and wide, nearly straight; otherwise as in *Tritonofusus* s. s.

Subgenus **Ancistrolepis** Dall.¹ Type, *Chrysodomus eucosmius* Dall, Bering Sea.

Shell bucciniform, with a short twisted canal and the operculum claw-shaped, concave, with apical nucleus; penis on a stout stalk with the distal extremity pediform, enlarged, without a terminal papilla; dentition as in *Chrysodomus*, but the radula is degenerate and disproportionately small. The periostracum is conspicuous and villous.

Subgenus **Mohnia** Friele, 1878. Type, *Fusus mohnii* Friele.

Shell as in *Siphonorbis* or *Plicifusus*, but the whole nepionic shell smooth (it is sculptured up to the larval whorls in the other species); operculum coiled, pauci-spiral; radula, with one cusp on the rhachidian and two on each lateral tooth; ovicapsules solitary, as in *Tritonofusus*.

Genus **Volutopsius** Mörch. Type, *Strombus norvegicus* Gmelin.

Shell large, solid, with a short spire, ample last whorl and short, wide canal, the ovate operculum not closing the aperture in most of the species; the nucleus small, swollen, globose; the ovicapsules large, solitary, hemispherical, attached by the whole of the broad side, containing several embryos. Dentition as in *Chrysodomus*, but irregular.

In these forms the shape of the shell does not appear to be correlated with sex. The sculpture is variable, often rude, sometimes with broad obscure axial ribs, but usually almost entirely spiral, varying from very fine to coarse in the different species. They are confined to the colder waters of the Northern Hemisphere and are especially numerous in the region of Bering Sea.

Subgenus **Pyrolofusus** (Beck) Mörch. Type, *Fusus deformis* Gray.

Shell large, thin, usually sinistral; spirally striated, axially obscurely folded, with a very large swollen nucleus; operculum much smaller than the aperture, subquadrate; canal short, wide; spire short, last whorl much the largest; dentition chrysodomoid, but rather irregular, the cusps of the rhachidian tooth small, some of them sometimes obsolete; laterals with the terminal cusps large, the central cusp often absent or obsolete; ovicapsules solitary, large, and hemispherical, attached as in *Volutopsius*, containing few embryos.

The Alaskan species is almost alone among the *Chrysodomoid* forms in exhibiting bright colors (salmon, orange, or rose-pink) in the enamel of the aperture. A pliocene form from Arctic Alaska is dextral and has a few very strong axial ribs.

¹ Proc. U. S. Nat. Mus., XVII, 1895, p. 709.

The following groups have been separated as a subfamily by Fischer on account of the edentulous rhachidian plate, but the advisability of this is as yet uncertain.

Genus **Liomesus** Stimpson. Type, *Buccinum dalei* J. Sowerby.

Shell bucciniform, usually solid, with a short twisted canal, smooth pillar and body, the outer lip thickened but not reflected, the operculum with apical nucleus; periostracum conspicuous, often villous; the rhachidian tooth is replaced by an edentulous plate and the laterals are simple curved denticles; the ovicapsules are pouch-shaped, solitary and pedunculate, attached by the edge of the disk and opening at the top.

Genus **Beringius** Dall, 1879. Type, *Chrysodomus crebricostatus* Dall.

Shell large, the last whorl ample, the canal short and wide; the nucleus subglobular, followed by a series of nearly equal turns, forming a cylindrical tip to the adult shell in most species; operculum small, not fully defending the aperture, somewhat arcuate, subovate, with apical nucleus; radula with an edentulous rhachidian plate; ovicapsules large, pedunculate, resembling those of *Liomesus*.

The sculpture in this group varies from smooth to fine spiral striation and even strong spiral ribs, but no species have been observed with axial ribbing, unless *Chrysodomus kennicottii* Dall should prove to belong to this group.

The family *Buccinidae* has recently been reviewed by Cossmann¹ in a memoir in which a large number of new names have been applied to fossil forms; but I am unable to regard any arrangement as final which does not take into account our knowledge of the relations of living species based on the anatomy, etc.

Troschelia Mörch (1876, + *Boreofusus* Sars, 1878), founded on *Fusus berniciensis*, according to the character of the radula is more closely related to *Fusus* than to any of the Buccinoid genera, though, from the form of the shell, often associated with the latter.

CHRYSDOMUS TABULATUS Baird.

Plate XXXVI, fig. 5.

Chrysodomus tabulatus BAIRD, Proc. Zool. Soc. for 1863, p. 66.—CARPENTER, 2d Rep. Brit. Assoc., 1863, p. 604.

Vancouver Island to Catalina Island (in water constantly deeper southward) in 5 to 150 fathoms. U.S.N.M., 15503.

This species is of a yellowish white color, often with a deeper tint in the throat. In its tabulated whorls it is almost unique, the only other form being the *C. pericochlion* of Schrenck, from the Japanese seas. Its analogue in the *Buccininae* is found in *B. hirasei* Pilsbry and *B. taphrium* Dall, for which I have proposed the section *Sulcosinus*.

¹ Essais de Paléoconchologie comparée, I, Pt. 4, 1901, pp. 96, 136.

TRITONOFUSUS HALLII Dall.

Plate XXXVI, fig. 9.

Sipho hallii DALL, Proc. Cal. Acad. Sci., V, April, 1873, p. 68, pl. II, fig. 3.

Sanborn Harbor, Nagai, Shumagin Islands, Alaska, W. G. Hall.
U.S.N.M., 108981.

This shell is of a white color, covered by a polished, closely adherent yellow brown periostracum. It is of a very solid build, with obsolete spiral sculpture visible in a good light.

TRITONOFUSUS (PLICIFUSUS) BRUNNEUS Dall.

Plate XXXIV, fig. 1.

Chrysodomus brunneus DALL, Proc. Cal. Acad. Sci., VII, March, 1877, p. 6; Sci. Expl. Alaska, *Buccinidæ*, 1879, pl. II, fig. 4.

North end of Nunivak Island, Bering Sea, near Cape Etolin, in 10 fathoms; Dall. U.S.N.M., 108984.

This species is of a rosy brown, with a dull surface and sharp sculpture.

TRITONOFUSUS (PLICIFUSUS) VIRENS Dall.

Plate XXXVI, fig. 8.

Chrysodomus virens DALL, Proc. Cal. Acad. Sci., VII, Mar., 1877, p. 6; Sci. Expl. Alaska, *Buccinidæ*, 1879, pl. II, fig. 3.

Kyska Harbor, Aleutian Islands, in 10 fathoms; Dall. U.S.N.M., 108982.

The shell is of a brownish color, covered, when fresh, by a polished grass green periostracum, which in the cabinet gradually fades. Its nearest relative is *Chrysodomus fusciligatus* E. A. Smith, from Japan.

TRITONOFUSUS (PLICIFUSUS) RECTIROSTRIS Carpenter.

Plate XXXIV, fig. 2.

Chrysodomus rectirostris CARPENTER, Proc. Acad. Nat. Sci. Phila. for 1865, p. 64.—DALL, Sci. Expl. Alaska, *Buccinidæ*, 1879, pl. II, fig. 1.

Puget Sound and the waters around Vancouver Island in 68 fathoms, Kennerley and Richardson. U.S.N.M., 4815.

The shell is white, with a polished olive brown periostracum and a tinge of reddish brown within the aperture. It is frequently eroded, especially near the apex, and the long slender canal is frequently distorted by fracture and repair.

TRITONOFUSUS (PLICIFUSUS) SPITZBERGENSIS Reeve.

Plate XXXVI, fig 7.

Fusus spitzbergensis REEVE, in Belcher's Last of the Arctic Voyages, II, 1855; App. p. 395, pl. XXXII, fig. 6, a—b.

Neptunea (Sipho) terebralis GOULD, Proc. Bost. Soc. Nat. Hist., VII, Sept., 1860, p. 326.

Sipho lividus (Mörch) VERRILL, Proc. U. S. Nat. Mus., VI, 1883, p. 238, pl. IX, fig. 12.

Spitsbergen and the Arctic and Bering seas. U.S.N.M., 108989.

This fine shell was described by Reeve and Gould from the same specimen in the Cumingian collection. It is, when in perfect condition, more or less marbled with dark reddish brown and lighter patches, most conspicuous on the spirals. In weathered specimens the color is apt to be lost. The axial sculpture is obsolete, but can usually be discerned near the apex. The sinuation of the outer lip, near the body, in the adult is profound. The sculpture is somewhat variable and the spiral ridges more or less prominent, fewer or more numerous, and the shell also varies in slenderness. The specimen figured is from Cape Espenberg near Bering Strait.

TRITONOFUSUS (PLICIFUSUS) ROSEUS Dall.

Plate XXXVI, fig. 4.

Chrysodomus roseus DALL, Proc. Cal. Acad. Sci., VII, 1877, p. 7; Sci. Expl. Alaska, *Buccinidae*, 1879, pl. III, fig. 5.

Arctic Ocean near Bering Strait, Capt. E. E. Smith. U.S.N.M., 108985.

Shell when fresh with a distinct rosy tint, fading in the cabinet to white, with a very thin pale olive periostracum. The apex is not swollen as in most of the species, but on the other hand is not planorboid as in *Siphonorbis*. It has a polished periostracum, and all the specimens dredged had a commensal sponge attached to the spire. The axial sculpture exists only in traces near the apex.

TRITONOFUSUS (PLICIFUSUS) MARTENSI Krause.

Plate XXXIV, fig. 6.

Sipho martensi KRAUSE, Arch. für Naturg. 1885, p. 287, pl. XVIII, fig. 18.—DALL, Proc. U. S. Nat. Mus., 1886, p. 302.

Chrysodomus martensi DALL, Proc. U. S. Nat. Mus., VII, 1884, p. 525. (Name only.)

Fusus (Euthria) conulus AURIVILLIUS, Vega Exp. vet. arb., IV, 1885, p. 354, pl. XIII, fig. 6.

Point Barrow and south to St. Lawrence Island, Bering Sea, in 12 to 55 fathoms. U.S.N.M., 108980.

In its blunted form, very short canal, punctate spiral striæ and obscure axial wrinkles near the suture, this species is rather peculiar. The shell is white with a brownish substratum and pale gray periostracum darker in the spiral grooves. The nucleus in all the specimens I have seen is defective.

TRITONOFUSUS (PLICIFUSUS) HERENDEENI Dall, new species.

Plate XXXVI, fig. 10.

Bering Sea and the Aleutian Islands in 50 to 100 fathoms; U. S. Fish Commission steamer *Albatross*. U.S.N.M., 107006.

Shell with about nine whorls, a slender spire, small but not planorboid nucleus, and pale olive periostracum. It is pinkish white with a yellowish substratum and the periostracum is dull and without polish or villosity; lines of growth distinct, spiral sculpture of fine striæ with wider flattish interspaces, alternately coarser on the base; suture deep, the whorl below it often obscurely puckered near the suture; canal rather short, wide, and recurved. Alt. 70.0, diam. 28.0 mm.

This elegant species has been obtained at a number of localities. The operculum is normal and rather light colored. The individuals vary somewhat in relative slenderness.

VOLUTOPSIUS TROPHONIUS, new species.

Dredged south of the Pribilof Islands, Bering Sea, by the U. S. Fish Commission steamer *Albatross*, at station 3602, in 81 fathoms, mud, bottom temperature, 37° F. U.S.N.M., 109167.

Shell with a short spire and robust body whorl; pale reddish-brown and white, with five or more whorls; nucleus of nearly two whorls, smooth, inflated, blunt above (diam. 6.5 mm.); a subsequent whorl irregular, finely spirally striate; after which the whorls develop (on the fifth about 22) high, thin, sharp, flexuous varices or lamellæ extending entirely over the whorl, somewhat irregular, and more or less spirally finely striated; aperture ovate, canal short, curved, and very wide; pillar thin, concave, short, twisted; outer lip expanded, thin; lon. of shell, 66; of aperture and canal, 40; max. diam. 37 mm.

This very remarkable shell is as profusely covered with lamellæ as the most ornamented *Trophon*, and is the first Northern species of the Buccinidæ to exhibit this kind of ornamentation.

The writer was looking in a jar of mixed alcoholic mollusks for a specimen of *Trophon stuarti* Smith, in order to examine the operculum, and selected this as the largest he had ever seen; but when the specimen was freed from a sponge which enveloped it, it was very evident that something quite distinct from any *Trophon* was in hand. The operculum is as usual in the genus, also the verge and other organs.

The specimen is obviously not fully mature, and must reach a larger size than that indicated by the measurements above given.

VOLUTOPSIIUS (BERINGII Middendorff var.?) KOBELTI Dall.

Plate XXXV, fig. 2.

? *Tritonium (Fusus) behringii* MIDDENDORFF, Bull. Acad. St. Petersb., VII, 1848, No. 16, p. 3; Beitr. Mal. Ross., II, 1849, p. 147, pl. III, figs. 5, 6.

Neptunea behringii (ex parte) KOBELT, Mart. Chemn. Conch. Cab., Neue Ausg.

Pyrula et Fusus, 1881, p. 67, pl. XII, figs. 2, 3.

Strombella beringi DALL, Sci. Expl. Alaska, *Buccinidae*, 1879, pl. I, fig. 1.

Pribiloff Islands, Bering Sea, and also at Nunivak Island. U.S.N.M., 108990.

The rarity of the specimens of this genus from the Pacific, Arctic, and Bering Sea, and the beach-worn condition of most of those obtained have led in the past to much confusion among the described species. Thus *V. castanea*, *V. behringii*, *Beringius kennicottii*, *V. malleatus*, and the present form have all been regarded as forms of one protean species by the few naturalists in Europe who have considered them at all. Now that fair series of these species have been obtained by the writer and the U. S. Fish Commission, a better discrimination is possible. Middendorff's *Tritonium behringii* (mel. *beringii*, to agree with the name of the explorer as properly spelled) was based on a beach-worn specimen obtained in Bering Sea at St. Paul Island by Wossnessenski. Nothing like it came under my notice for years, and having obtained specimens such as the one now figured I supposed the original type to be merely a somewhat abnormal specimen, and communicated my idea to Dr. Kobelt who figured specimens under Middendorff's name, also copying his figure. Lately, however, I have received a young specimen from St. Paul which agrees exactly with the characteristics of Middendorff's type. It is perfectly smooth, massively heavy and solid, and with very prominent solid ribs. I have no doubt it should be referred to *V. behringii*, and that it is probably distinct from the form which I now propose to call after Dr. Kobelt and have figured.

Beringius (or *Volutopsius*) *kennicottii* Dall is distinguished from all the other species by its more regular and numerous axial ribs and especially by the fine, close, wavy, spiral striation with which it is entirely covered. *V. castaneus* Mörch has no spiral sculpture whatever, and is otherwise sufficiently distinct. *V. kobelti* has the usual basal striation, but above the base the spirals when present are coarse, obsolete, sparse, and irregular. *V. behringii* Middendorff is absolutely smooth, except near the canal. The axial waves (they can hardly be called ribs) of *V. kobelti* are feeble and irregular, the shell is relatively thin and light compared with *V. behringii*, and has much coarser incremental lines, more acute and rather higher spire, and a less effuse

aperture. I am very confident that the receipt of adult specimens of *V. beringii* will confirm my present opinion of the specific distinction of the two forms.

VOLUTOPSIUS CASTANEUS Mörch.

Plate XXXVI, fig. 2.

Neptunea castanea MÖRCH, Novit. Conch., 1858, p. 7.

Neptunea badia MÖRCH, Novit. Conch., 1858, pl. I, figs. 1, 2.

Strombella castanea DALL, Sci. Expl. Alaska, *Buccinidæ*, 1879, pl. I, figs. 4, 4a.

Aleutian Islands and eastward to Kadiak, in shallow water. U.S.N.M., 108991.

An abundant species, usually of a livid brown color, rarely white, and with no visible periostracum. The surface is always rude, irregularly wrinkled, and destitute of any spiral sculpture. Mörch gave one name to it in the text of the Novitates, which I have adopted, but another appears by some error on the legend of the simultaneously issued plate.

VOLUTOPSIUS ATTENUATUS Dall.

Plate XXXVI, fig. 3.

Volutopsis attenuata DALL, Proc. Cal. Acad. Sci., V, 1874, p. 252.

Strombella attenuata DALL, Sci. Expl. Alaska, *Buccinidæ*, 1879, pl. I, fig. 2.

Bering Strait and adjacent Arctic waters.

The type specimen was obtained at Cape Espenberg by Capt. E. E. Smith. U.S.N.M., 108979.

This is a white, delicately spirally striated shell which appears to be rather rare, as only two or three specimens of it have come under my observation.

VOLUTOPSIUS REGULARIS Dall.

Plate XXXVI, fig. 6.

Volutopsis beringii var. *regularis* DALL, Proc. Cal. Acad. Sci., V, 1873, p. 59, pl. II, fig. 6.

Strombella regularis DALL, Sci. Expl. Alaska, *Buccinidæ*, 1879, pl. I, figs. 5, 5a.

Aleutian and Shumagin Islands, Alaska; rare. U.S.N.M., 108978.

This species is snow-white, with no visible periostracum, regularly formed, smooth, and, while smaller, has a proportionately more elevated spire than *V. castaneus*.

Genus BERINGIUS Dall.

Beringius DALL, Sci. Expl. Alaska, *Buccinidæ*, 1879, pl. II, figs. 1, 1a-c (sole example, *Chrysodonmus crebricostatus* Dall); Proc. U. S. Nat. Mus., IX, 1886, p. 304; XVII, 1894, p. 710.

Jumala FRIELE, Norwegian N. Atl. Exp., I, 1882, p. 6 (type, *Fusus turtoni* Bean); Ann. Mag. Nat. Hist., Nov., 1893, p. 352, *olim*.

Ukko FRIELE, in Norman, Ann. Mag. Nat. Hist., 6th ser., XII, 1893, p. 352.

BERINGIUS CREBRICOSTATUS Dall.

Plate XXXV, fig. 1.

Chrysodomus crebricostatus DALL, Proc. Cal. Acad. Sci., VII, 1877, p. 6.*Chrysodomus* (*Beringius*) *crebricostatus* DALL, Sci. Expl. Alaska, *Buccinidæ*, 1879, pl. II, figs. 1, 1a-c; Proc. U. S. Nat. Mus., IX, 1886, p. 304; XVII, 1894, p. 710.

Unalaska, Aleutians, in 100 fathoms, Dall; Aleutian Islands and the Shumagin Islands, U. S. Fish Commission. U.S.N.M., 122716.

This magnificent shell is perhaps the finest species of the family. It is white with a darker flush in the throat, and covered with a bright yellowish periostracum.

BERINGIUS? KENNICOTTII Dall.

Plate XXXV, fig. 3.

Buccinum kenicottii DALL, Am. Journ. Conch., VII, 1871, Pt. 2, p. 108, pl. xv, fig. 1.*Chrysodomus kenicottii* DALL, Proc. Cal. Acad. Sci., IV, 1872, p. 271; Sci. Expl. Alaska, *Buccinidæ*, 1879, pl. IV, figs. 1, 1a.*Neptunea behringi* KOBELT, Conch. Cab., 2d ed., *Pyrula* and *Fusus*, 1881, p. 68; not of Middendorff.

The Kadiak group of islands is the headquarters of this species, which extends to the Shumagins and westward, but not abundantly west of the peninsula. It occurs in shallow water, during the spawning season, but at other times retires to 10 or 15 fathoms depth. U.S.N.M., 108992.

This species has a handsome light-brown periostracum, under which the shell is white or purplish, sometimes pinkish in the aperture. It is uncertain whether it should be referred to *Volutopsius* or to *Beringius*, as the dentition has not been examined, but the very cylindrical nepionic whorls rather point toward the latter.

Genus LIOMESUS Stimpson.

Liomesus STIMPSON, Canadian Nat., new ser., II, Oct., 1865, p. 364.*Buccinopsis* JEFFREYS, not of Conrad.

LIOMESUS NUX Dall.

Plate XXXVIII, fig. 7.

Liomesus nux DALL, Proc. Cal. Acad. Sci., VII, Mar., 1877, p. 7 (p. 2 of extras).*Buccinopsis nux* KOBELT, Conch. Cab., 2d ed., *Buccinum*, 1883, p. 101, pl. LXXXVIII, fig. 4.

East shore of Nagai Island, Shumagins, and at Unalaska in 15 fathoms, Dall. U.S.N.M., 94785.

The shell has a purplish brown substratum more or less obscured by a creamy white outer coat, and in life is covered by a dense velvety periostracum. It is remarkably solid and heavy for its size. The genus is *Buccinopsis* Jeffreys not Conrad, and *Liomesus* of Stimpson in allusion to its unarmed central teeth of the radula, which resemble those of *Beringius*.

LIOMESUS CANALICULATUS Dall.

Plate XXXVIII, fig. 2.

Buccinopsis canaliculata DALL, Proc. Cal. Acad. Sci., V, Feb., 1874, p. 252 (extras p. 6).—KOBELT, Conch. Cab., 2d ed., *Buccinum*, 1887, p. 102, pl. LXXXVIII, fig. 10.

Liomesus canaliculatus DALL, Sci. Expl. Alaska, *Buccinida*, 1879, pl. iv, fig. 4.

North end of Nunivak Island, Bering Sea, Dall. U.S.N.M., 108977. Shell white with a yellow velvety periostracum. This species was figured in my Exploration of Alaska, *Buccinida*, Plate iv, fig. 4, and *L. nux* as fig. 5, 1879; but the text for these plates is still unprinted.

LIOMESUS OÖIDES Middendorff.

Tritonium oöides MIDDENDORFF, Bull. Acad. St. Petersb., VII, 1848, No. 16, p. 16;

Malak, Ross, II, 1849, p. 175.

Tritonium ovoides MIDDENDORFF, Sib. Reise, 1851, p. 236, pl. VIII, figs. 7, 8.

? *Liomesus ovoides* STIMPSON, Canadian Nat., new ser. II, Oct., 1865, p. 364.

Buccinum ovoides KOBELT, Conch. Corb., 2d ed., *Buccinum*, 1883, p. 72, pl. LXXXVII, fig. 6.

Tugur basin, Okhotsk Sea, Middendorff. Bering Strait, Stimpson.

This species, by an easy typographical error, has two names in Middendorff's works. It seems to differ from *L. canaliculatus* Dall by its shorter spire, less regular form, and less distinct spiral sculpture. The species found by Stimpson at Bering Strait is probably *canaliculatus*. Further material may show the desirability of uniting the two, in which case Middendorff's name has twenty-five years priority.

In my plates of *Buccinida*, specimens of *Liomesus dalei* Sowerby, var. *burnea* Sars, from the Doggerbank, were figured for comparison with the Alaskan forms. My friend Dr. Kobelt, in the absence of the text relating to these plates, was led to suppose them from Alaska, and applied the varietal name of *Behringiana* to them.¹ But this species is not found in the western hemisphere as far as I know. I am inclined to doubt the identity of the Crag form with the recent one, and should be disposed to adopt Sars's name in a specific sense. I have never seen any recent specimens at all resembling the massive shells from the British Crag. I may add that another species of this genus, *L. nassula*, was recently described by me from Bering Sea.

ASTYRIS AURANTIACA Dall.

Plate XXXIV, fig. 5.

Astyris aurantiaca DALL, Am. Journ. Conch., VII, 1871, Pt. 1, p. 115, pl. xv, fig. 13 (bad).

Monterey, at low water, Dall. U.S.N.M., 12313.

The color varies from orange yellow to brown or yellow with zigzag brown markings. It is generally subtranslucent.

¹ Conch. Cab., 2d ed., *Buccinum*, 1883, p. 100.

MUREX (PTEROPURPURA) CARPENTERI Dall.

Plate XXXIV, fig. 9.

Pteronotus carpenteri DALL, Nautilus, XII, No. 12, April, 1899, p. 138.

Farallones Islands, California, south to the vicinity of San Diego, California, in 15 to 60 fathoms. U.S.N.M., 122596.

The shell is of a somewhat livid pale brown, pinkish toward the apex and white around the aperture. The surface, except of the nuclear whorls and the anterior faces of the varices, is smooth. The genus resembles *Pterorhytis* Conrad very much, except in the absence of the spur on the outer margin of the aperture. There are three series of confluent varices.

This subgenus was indicated by Jousseaume, in 1880; the name *Pteronotus* Swainson, is preoccupied by Gray, in *Reptilia*. In 1899, however, Rovereto proposed for this group the name *Pterymurex*, which is entirely unnecessary; an occurrence which shows how inadvisable it is to propose new names for those supposed to be preoccupied, without knowing the whole history of the names in question, and their synonyms.

MUREX (PTEROPURPURA) PETRI Dall.

Plate XXXIV, fig. 7.

Murex petri DALL, Nautilus, XIV, August, 1900, No. 4, p. 37.

San Pedro, California, in about 50 fathoms; Oldroyd. U.S.N.M., 122553.

This species is of a yellowish-white color, covered with finely imbricated spiral threads, of which about every fourth one is slightly larger. The aperture is white and the varices distally recurved.

ANTISTREPTUS, new genus.

Shell small, having the general form of *Anachis*, sinistral, with a dextral nucleus; the operculum as in *Trophon*. Type, *A. magellanicus* Dall, Straits of Magellan.

ANTISTREPTUS MAGELLANICUS, new species.

Shell small, porcellaneous white with a straw colored periostracum, sinistral with a smooth polished dextral nucleus and about four subsequent whorls; spire rather acute, body whorl moderately rounded; suture distinct; pillar straight, unarmed; canal short, rather wide, slightly recurved; outer lip simple, sharp; no callus on the body; sculpture of strong, high, coarsely beaded spirals with narrower interspaces, the swellings or beads occurring vertically below one another on the several spirals giving the effect of ribs; there are two spirals on

the first whorl and three on the subsequent whorls in front of the suture, and on the last whorl there are nine or ten diminishing in size forward, from the periphery to the end of the canal, but of the same general type; they are crossed only by fine incremental lines. Lon. of shell 4.5; max. diam. 2.5 mm.

Dredged by the U. S. Fish Commission steamer *Albatross* in the straits of Magellan at station 2777, in 20 fathoms, gravel. U.S.N.M., 96190.

This very remarkable little shell has the general form of an *Anachis*, but the sculpture is more like some of the species of *Trophon*, while the pale yellow operculum is also much like that of *Trophon*. If it were not that the torsion of the nuclear and subsequent whorls is in opposite directions, the shell might be taken for a very minute reversed *Trophon* or *Urosalpinx*. It may be that the two specimens which were obtained and which agree perfectly are immature, and that the aperture may be lirate when fully grown, but there is no indication in the shell to suggest it.

Genus TROPHON Montfort.

The genus *Trophon*, founded on the Patagonian species *geversianus* of Pallas, belongs to the Purpuroid group of Murices with *Ocenebra* and *Eupleura*. The larger species show the peculiar rotating imprints on the proximal face of the operculum, which are usually regarded as characteristic of *Purpura*. The smaller species with thin opercula do not always develop these markings. The nucleus of the operculum is on the outer side between the middle and the lower angle, exactly as in some *Purpuras*, with a callus around the inner margin. The nuclear whorls of *Trophon* are small and either inflated or, by reason of a small carina, flattened above and tilted, so that the plane of the first whorl forms an angle with that of the succeeding whorls. This is sometimes so marked that at first sight it appears as if the nucleus was reversed as in *Pyramidellidae*, but a careful examination shows that this is not the case. Most species have the nepionic whorls immediately following the nucleus sculptured, and often cancellated, whether the remainder of the whorls are so or not, indicating the derivation of the group from a cancellated, or, at least, a sculptured ancestral type.

The typical Trophons are chiefly austral and have a rather characteristic type of form and sculpture. The boreal forms show more variety and have developed several types among themselves, all different from the antarctic group, and which I therefore separate as a genus, *Boreotrophon* (Fischer, 1884). This genus, again, is divisible into several sections characterized by their sculpture. The typical *Boreotrophon* has lamellar varices, the spiral sculpture is absent or feeble, and the operculum is elongated and narrow with the nucleus apical, and no purpuroid markings on the inner face. The section *Trophonopsis* (B., D., and D., 1882) has spiral sculpture quite emphatic, and some-

times the varices are obsolete. The operculum is short and wide with an apical nucleus, but with purpuroid markings on the inner face. In each group a transition toward the other section may be observed in some species. Both agree in dentition and station. In the majority of species there is occasionally developed a carina at the shoulder over which the varices are elevated into spines or elevated scales.

There are, however, species which always have an angle or varical spine at the shoulder. The development of the varices is different in different individuals of the same species, as in *Murex*; specimens from a fine sandy or soft bottom will frequently have remarkably broad, thin, expanded varices; while those from an unfavorable situs, as a gravelly bottom, may have the varices degenerated to mere lines hardly raised above the surface except at the shoulder. These differences, though systematically not important, affect the general appearance of the shell very much and are liable to mislead students unfamiliar with the group into an undue multiplication of species. On the other hand the general impression of variability which these mutations give is apt to lead to the ignoring of real differences of a more stable kind, and hence several very distinct species have been consolidated by too hasty monographers.

The species which have a small compact body and spire, coronated with spines, and a long rather straight canal, have been separated as a section *Pagodula* by Monterosato in 1884, with *B. carinatus* Bivona, as type; but taken in connection with other species, these, like the species of *Trophonopsis*, gradually merge into the typical form of the genus, even within the limits of the more variable species. A group which perhaps deserves distinction is that which I will call *Actinotrophon*, based on *B. actinophorus* Dall, in which with the structure of the thin *Borrotrophon* with long coronating spines is united a feature, not elsewhere noted in the genus, of successive canals, so curved that the projecting old ones, recurving from the siphonal fasciole form a whorl of hollow split spines, diverging from a deep umbilical pit, as in some murices. In *Murex*, however, the canal is closed and the aperture has a projecting callous margin.

Another group, possibly worthy of sectional distinction, appears in the fauna of southern California, where it is represented by *Trophon triangulatus* Carpenter, *T. cerrosensis* Dall, and *T. pinnatus*, new species. These forms are large, with prominent varices, hardly any spiral sculpture, and brown or yellow coloration. They have the typical purpuroid operculum of the Antarctic *Trophon*, but not its stumpy form or coarse reticulate sculpture. The siphonal fasciole is more or less gyratory and between it and the edge of the aperture is a distinct umbilical chink or even a deep perforation. If these are considered sufficiently marked to deserve a sectional name, they may be referred to the genus *Trophon* with that rank, under the name of *Austrotrophon*.

A subdivision of the old group included under the name of *Trophon* was published¹ by De Gregorio. This was hastily done, and several of the groups had previously been named, while others are heterogeneous. Examples are cited, but no types selected. The scheme is as follows:

Genus *Trophon* de Gregorio, 1885, = *Trophon*, Montfort, 1810.

Subgenus *Pinon* de Gregorio, 1885, = *Boreotrophon* Fischer, 1884, + *Fusus* sp. + *Columbarium* von Martens, 1881.

Subgenus *Chalmon* de Gregorio, 1885, = *Trophonopsis* Bucquoy, Dautzenberg, and Dollfus, 1882.

Subgenus *Pirgos*² de Gregorio, 1885, may stand as a section of *Trophonopsis* with *Trophon alveolatus* (Sowerby) Wood, as type.

Subgenus *Mipus* de Gregorio, 1885, founded on *Trophon gyratus* Hinds, is probably referable to *Coralliophila* or *Latiaris*.

There a number of other genera which have been proposed which are closely related to *Trophon*, but which will not be discussed on this occasion.

I need not dwell on some groups proposed by Hutton for Antarctic forms which he places under *Trophon*, but which appear to me to be more properly grouped under genera like *Purpura* or *Ocenebra*. A few notes on austral American species may be offered here.

TROPHON CRISPUS Gould.

Fusus crispus GOULD, Proc. Boston Soc. Nat. History, III, May, 1849, p. 141; Otia Conch., p. 64; Shells of the Wilkes Exploring Expedition, 1852, p. 229, pl. xvi, figs. 279, 279a, 279c (not fig. 279b).

Trophon crispus GOULD, Otia Conch., p. 245, 1862.

Orange Harbor, Patagonia, Couthouy. Type, U.S.N.M., 5677.

With this as a variety was included the following very distinct species:

TROPHON PELECETUS, new species.

Fusus crispus var., GOULD, Shells of the Wilkes Exploring Expedition, 1852, p. 229, pl. xvi, fig. 279b.

This remarkable form, though much smaller than the *T. crispus*, has one more whorl, being seven, including the nucleus. The spire is very acute, the last whorl much the largest, with deeply constricted sutures; the whorls tabulate above with nine very strong angular varices, the interspaces narrow and deep, the distal edges of the varices thick and broad, somewhat crenulate by revolving threads, sometimes obsolete between the varices, and on them crossed by prominent incremental lines; margin of the aperture callous, but not denticulate; canal slender, slightly recurved, and rather long. The color is yellowish white. Lon. of shell 16.5; of aperture 9.0; max. lat. of shell 8.0 mm.

¹ Bulletin of the Societa Malac. Italiano, XI, p. 27, August, 1885.

² Not *Pyrgus*, Hübner, 1816, *Lepidoptera*.

The very peculiar sculpture recalls that of some species of Cancellariidae of the genus *Trigonostoma*. In the young the revolving threads are more prominent than in the older specimens. U.S.N.M., 98451.

? **TROPHON UNICARINATUS** Philippi.

Fusus unicarinatus PHILIPPI, Malak. Blätt., XV, Dec., 1868, p. 223.

Trophon unicarinatus TRYON, Man. Conch., II, 1880, p. 151.

Magellan Strait, Acton, *vide* Philippi; dredged by the U. S. Fish Commission steamer *Albatross* in the strait, at station 2777, in 20 fathoms, gravel, U.S.N.M., 96193.

The little shell described by Philippi under the name of *Fusus* has much the aspect of a miniature *Chrysodomus* of the *despectus* type. If so it is the only representative of that group in the Antarctic. It is more likely, in spite of the resemblance, that it is related to the *Trophon*, so abundant in these seas. Unfortunately all the specimens dredged were destitute of the soft parts, so that the anatomical features and operculum remain unknown.

The nucleus is large for the size of the shell, smooth, inflated, and so loosely twisted that it at first suggests a sinistral beginning, which is not confirmed by a closer examination. The whorls are flat above, with a strong, blunt peripheral carina and a second less prominent keel, just below the periphery, on which the suture is laid. The surface is axially faintly striated by the incremental lines. The base is moderately rounded and passes into a slightly recurved canal as in *Chrysodomus*. The body of the shell is of the pale brown, with a slight tinge of purple, characteristic of the Arctic *Chrysodomus*, but the pillar is white and so is the canal, and the keels are lighter than the body color of the shell. The outer lip is simple and hardly thickened and the throat smooth. The largest specimen obtained by the Fish Commission was 8.5 mm. in length and 5 mm. in maximum width. The longest diameter of the aperture was a little less than 5 mm.; there were two nuclear and three subsequent whorls.

Altogether it is a remarkable little shell, which a comparison with the young of several of the larger prosobranchs of the region indicates to be a well-defined and distinct species, worthy of more thorough study than my material makes practicable.

GENUS BOREOTROPHON (Fischer) 1884.¹

In briefly reviewing the group it may be useful to enumerate the boreal species by geographical regions, namely, that of North Europe, including the northeast Atlantic, Iceland, and Greenland, which belongs more to Europe than America, faunally; of the northeast coast of North America, including the cold deep waters adjacent which carry boreal species far southward of their natural habitat if

¹ If Bolten's undefined names are to be accepted this genus, by elimination, must take the name of *Neptunea*.

we regard only the surface isotherms; and of the North Pacific and Bering Sea, including the adjacent portions of the Arctic and the northern islands of Japan.

The species of the northeast Atlantic are as follows, omitting those of the Mediterranean and the Azores which are clearly subtropical and do not enter the cold abysses or extend their range north of Gibraltar:

BOREOTROPHON CLATHRATUS Linnæus.

This is the *Murex clathratus* Linnæus, 1766, described from an Icelandic specimen; it is the *M. bamffius* Donovan, 1803, and has been confounded with most of the typical arctic species of *Boreotrophon* by authors. Mörch stated in his catalogue of Greenland shells (1857) that this species was called *Tritonium rossii* by Leach, and he sent a specimen to the U. S. National Museum under the name of *Trophon richardsonii* Gray, from Spitsbergen. Both of these names appear to be unpublished—or at least I have been unable to find them in the literature. Reeve in his monograph of *Fusus* figures two species under the name of *bamffius* (sic), but neither is the *bamffius* of Donovan. Mörch also refers to the latter the fossil *Murex costatus* of Hisinger, 1837. It is a small but stout shell with very round whorls, a short and much recurved canal, ten to eighteen rather irregular, rarely prominent, more or less appressed laminar varices, no spiral threads, and only rarely any fine spiral striation. I have seen none exceeding 30 mm. in length, and at the shoulder the angle of the varices is rarely present; and if present, feeble and inconspicuous. Its range extends from Finmark to Greenland. I have never seen an American specimen.

BOREOTROPHON TRUNCATUS Ström.

This is *Buccinum truncatum* Ström, 1767; it is frequently confounded with the preceding and with *B. scalariformis* Gould. It is a small species, not exceeding 17 mm. in length and usually smaller. It was figured by Forbes and Hanley under the name of *bamffius*, but it is not the original *bamffius* of Donovan. It has numerous low, rather irregular and close-set varices which are often obscurely crenulate as if by obsolete spiral threads; there is rather strong spiral striation in well-developed specimens. The canal is short and obliquely truncate, the aperture and canal shorter than the spire. It is the most common North Atlantic species, and extends in 10 to 50 fathoms from Finmark to Greenland and south to Georges Banks on the American coast.

BOREOTROPHON GUNNERI Lovén.

This species, discriminated by the accurate Lovén in 1846, has been widely and generally confused with *B. clathratus*, of which it is

usually called a variety. That species sometimes has a feeble varical angle on the shoulder, but the present one is always angular there, the varices stand out from the shell and are distinctly developed; the suture is rather constricted and the whorl in front of it usually excavated; the surface is closely spirally striated, the spire elevated, the canal nearly straight. There are eight to eleven varices and the angle at the shoulder is often nearly spinose. The species reaches a length of 33 mm., and ranges from Finmark to Greenland and Massachusetts in 3 to 200 fathoms. It is a more slender and elegant shell than *B. clathratus*. Reeve's figure of "*Fusus*" *gunneri* in the *Iconica* does not represent this species.

Section **TROPHONOPSIS** Bucquoy, Dautzenberg, and Dollfus, 1882.

BOREOTROPHON MACLAINI, new species.

Shell small, yellowish white with five or more whorls; nucleus tilted, smooth, flat above, with the margin of the plane forming a strong carina which is continued as a spiral thread at the shoulder in the subsequent whorls; the first whorl which follows the nucleus has two spiral threads, the number of these gradually increases until the fifth whorl has thirteen, closer in front of the suture and behind the shoulder and also on the base; less crowded on the periphery, and crossing (on the fifth whorl twenty) arcuate, regular, slightly elevated ribs with subequal interspaces which extend over the periphery and fade out on the base; spire longer than the aperture; canal straight or slightly recurved, short; pillar straight, obliquely truncate in front; periostracum yellowish; lon. of shell 6.5; of aperture 3.2; max. diam. 3.0 mm.

Dredged off the coast of Greenland by Ensign C. S. McClain, of U. S. S. *Alert*. U.S.N.M. 126974.

This is a *Trophonopsis*, somewhat of the type of *B. barvicensis*, which, however, has a rounded nucleus and lamellar varices. The single specimen obtained is not fully mature and the species doubtless attains a somewhat larger size. It can not be mistaken for any of the other species of the region.

BOREOTROPHON CRATICULATUS Fabricius.

This is the *Tritonium craticulatum* Fabricius in 1780 (not the *Murex craticulatus* of Linnæus), the *T. fabricii* Beck, 1842, and the *T. borealis* of Reeve (as *Murex*), 1845.

Greenland is its metropolis, but it extends, in 30 to 80 fathoms, to the Newfoundland Banks on the south and Finmark on the east. It is the type of the section *Trophonopsis*, and is readily recognized by its elongate form, thin, rather rude varices and strong spiral threading. It rarely develops a varical angle at the shoulder.

BOREOTROPHON BARVICENSIS Johnston.

This species, described in 1818, is of a southern reticulate muricate type, resembling *B. muricatus* Montagu. Like the latter, it reaches British shores, though its metropolis is to the southward, in 15 to 1,000 fathoms. It has been reported, erroneously, from the American coast.

BOREOTROPHON MURICATUS Montagu.

This is the *Murex muricatus* Montagu, 1803; the *Fusus variabilis* Cristofori and Jan, 1833; and the *Fusus echinatus* Philippi, 1836.

It is a very elegantly sculptured form, extending from British waters to the Atlantic coast of Morocco, in 2 to 1,000 fathoms.

Section **PAGODULA** Monterosato, 1884.

BOREOTROPHON CARINATUS Bivona.

This is the *Murex carinatus* Bivona, 1822; the *M. vaginatus* Cristofori and Jan, 1833; the *M. calcar* Scacchi, 1836; *Fusus echinatus* Kiener, 1838, and the type of the section *Pagodula* Monterosato, in 1884. It extends from Marseilles in the Mediterranean to the Atlantic coast of Morocco, in 15 to 1,600 fathoms. It is mentioned here because it has been erroneously reported as having been obtained near Marthas Vineyard on the American coast.

BOREOTROPHON CLAVATUS Sars.

This species, which has been confused with *B. carinatus* Bivona, was described by Sars in 1878. It appears to be confined to northern Scandinavia, though some American forms were, for a time, erroneously referred to this species, a mistake which has since been corrected.

The following species have been described from the Mediterranean and tropical East Atlantic, most of which are deep-water or even abyssal forms: *B. decoratus*, *B. cossmanni*, and *B. deversus* Locard, 1897; *B. (Trophonopsis) varicosissimus* Bonelli (1841, + *multilamellosus* Philippi, 1844); *B. (T.) droueti* and *B. (T.) dabneyi* Dautzenberg, 1889; *B. (T.) richardi* and *grimaldii* Dautzenberg and Fischer, 1896. *Orania* Pallary, 1900, appears to be a section of *Ocinebra* and not referable to *Trophonopsis*.

The following species are known from the east coast of North America:

BOREOTROPHON TRUNCATUS Ström.

Arctic seas and south in deeper water to Georges Banks.

BOREOTROPHON GUNNERI Lovén.

Same distribution as the preceding.

BOREOTROPHON SCALARIFORMIS Gould.

This is the *Fusus scalariformis* Gould, in 1838, a large species, which has been confounded with *B. clathratus*, but is easily identified. It is the largest Atlantic species, sometimes reaching a length of 53 mm., having 13 to 16 rather rude sharp lamellar varices, 8 whorls, a higher and more conical spire, a straighter and a more gradually attenuated canal and less excavated base. There is rarely any angle at the shoulder; if the varix is elevated here it is bluntly rounded, and the surface has only obsolete spiral striation or none. Its range is from Iceland to the Newfoundland Banks and Massachusetts Bay, and most of the specimens have been obtained from the stomachs of the haddock.

BOREOTROPHON CRATICULATUS Fabricius.

This species, which is characteristically Arctic, extends its range southward as far as the Newfoundland Banks.

BOREOTROPHON ACULEATUS Watson, var. **LACUNELLA** Dall.

I do not feel able to separate specifically the variety described in 1889, from Watson's species dredged off Pernambuco in deep water by the *Challenger*, and named in 1882. The differences are those which may be observed in any large series of a single species of arctic *Trophon*. The variety was described from the vicinity of Cape Fear, North Carolina, and I am unable to separate from it the *Trophon verrilli*, described in 1893, from the same locality by Miss Bush. An extremely similar form was dredged off the coast of Senegal in about 875 fathoms by the *Travailleur*, and described by Locard in 1897, under the name of *T. cossmanni*. It appears to differ only by the presence of a few feeble spiral threads visible between the varices. The variety *lacunella* ranges in deep water from the vicinity of Cape Fear south to the lesser Antilles, in 227 to 769 fathoms, and also occurs in the Gulf of Mexico.

BOREOTROPHON ABYSSORUM Verrill.

This is *Trophon abyssorum* Verrill, 1885, and its variety *limicola* with obsolescent spines, which was erroneously identified by Jeffreys with *T. vaginatus* Cristofori and Jan, of the Mediterranean, and with *T. clavatus* Sars of Norway. It is a small, well-defined species, with sharp laterally flaring spines at the shoulder, and the varices obsolete elsewhere. In the variety *limicola* the spines are obsolete and the varices more in evidence. The known range of both extends from Georges Bank off Cape Cod, south to the vicinity of Cape Hatteras, North Carolina, in 843 to 1,859 fathoms. This and the preceding species are referable to the section *Pagodula*.

Section ACTINOTROPHON Dall, 1902.

BOREOTROPHON ACTINOPHORUS Dall.

This is *Trophon actinophorus* Dall, 1889, dredged by the U. S. S. *Blake* off Barbados, Santa Cruz, and Martinique, in 140 to 248 fathoms. It is figured in the Blake report, and with its two whorls of channeled spines can not be mistaken for any other species.

This completes the list of known East American species, which will doubtless be enlarged when more dredging is done on our southern coasts.

The northwest coast of America is very rich in species, but the monographs of Sowerby and Tryon are so unsatisfactory that they afford little help, and confound perfectly discriminable species together. The following list is made out from the species in the National Collection, where there is preserved an unparalleled series of the group from this region. I begin with the species referable to *Trophonopsis*.

Section TROPHONOPSIS Dautzenberg.

BOREOTROPHON TENUISCUPTUS Carpenter.

This elegant and variable form was described by Carpenter in 1866, from the Pleistocene of Santa Barbara, California. It now ranges from Estero Bay, near San Luis Obispo, California, northward to the Aleutian Islands. It is the *Trophon subseratus* Sowerby, 1880, described from Vancouver. It is found in the north from low water to 10 fathoms, but the Californian specimen was dredged in 92 fathoms. I have not found it west of Unalaska and it is very rare south of Cape Mendocino. It has the usual mutations, the whorls either rounded, with close fine imbricate spiral sculpture, or with a coronated angle at the shoulder. The northern specimens are larger and heavier than those from the south and less disposed to be spinose, but the change, geographically, is gradual.

BOREOTROPHON SCITULUS Dall.¹

Described in 1891 from specimens dredged off Unalaska, in Bering Sea, at a depth of 225 to 309 fathoms. Its range in deep water probably extends to San Pedro Channel, California.

BOREOTROPHON KAMCHATKANUS, new species.

Shell small, solid, yellowish white, with about five whorls; nucleus lost; subsequent whorls with (on the fifth twenty-one) low, rude, rib-like varices, crossed by four or five obscure revolving cords, of which two are visible behind the sutures; in front of the suture is a sloping space somewhat constricted, at the shoulder is a cord, followed by others with wider interspaces and toward the canal more feeble; the

¹ Figured in Proc. U. S. Nat. Mus. XVII, 1895, pl. xxvii, fig. 5.

incremental lines are also conspicuous; canal twisted, recurved, rather short and wide, aperture white, body and pillar callous, the latter twisted and obliquely truncate in front, forming a nearly pervious axis; lon. of shell 25; of aperture and canal 15; max. diam. 12 mm.

Dredged by the U. S. Fish Commission steamer *Albatross* on the southeast coast of Kamchatka, at station 3644, in 96 fathoms, shelly bottom, temperature 33° F.

This species very much resembles *Trophon droueti* Dautzenberg dredged in some 600 fathoms near the Azores, but is nearly twice as large, with a relatively shorter canal. Owing to the low, thick, rib-like varices it does not at first recall *Boreotrophon* so much as some of the *Fusus* group from deep water. The operculum, however, is like that of *Trophonopsis* and not like that of *Fusus*. The species would be referable to the group named *Pirgos* by de Gregorio in 1885, and founded on two Pliocene forms from the English Crag.

BOREOTROPHON ORPHEUS Gould.

This is *Fusus orpheus* Gould, 1849, and *Trophon fabricii* Carpenter, 1863, not of Beck, 1842. The present writer, misled by an error of Carpenter, in common with most of the malacologists of the Pacific coast, identified this with *Trophon stuarti* Smith for many years, but the more careful study of Gould's type and the reception of full-grown specimens show that it is a well-defined and distinct, though apparently rather rare, species. It may be distinguished from the young of *B. stuarti* by having more than two spiral threads on the upper whorls. Adult it is a much smaller species than *stuarti*, slender and with low numerous varices. It ranges from Vancouver Island to Cape Mendocino.

BOREOTROPHON STUARTI E. A. Smith.

This fine species was first described in 1880, though it had been well known to California collectors for twenty years under the mistaken name of *Trophon orpheus*. It ranges from the Shumagin Islands, Alaska, to Santa Cruz, California, in from 16 to 202 fathoms, living in shallower water at the north and following the temperature into deeper water at the south. It has from seven to twelve varices with the interspaces crossed by four or five rounded spiral cords, and reaches a length of 52 mm. The varices may be wide and thin with prominent spines at the shoulder, or low and hardly stronger than the spirals and without any spines, a form which has a very different aspect from that of the type, the cancellation being very conspicuous.

BOREOTROPHON (STUARTI var.?) SMITHI, new species.

This form is known to range from Fuca Strait to Santa Barbara, California, in 39 to 75 fathoms. It much resembles *B. stuarti* in general, but differs by more slender whorls with a more constricted

suture, relatively wider varices, and the absence of any spiral sculpture. It has six to eight varices, very thin, wide and sharp with high, strongly recurved spines at the shoulder. It reaches a length of 47 and a width of 23 mm. with six whorls exclusive of the nucleus. The canal is strongly recurved and imbricating remnants of old canal ends are noticeable on the siphonal fasciole. It may, perhaps, prove to be a deep-water form of *B. stuarti*, but if so it is yet to be shown by intermediate mutations. It is of a whitish color with a pale-brown or yellowish periostracum. U.S.N.M., 122582.

Section BOREOTROPHON s. s.

BOREOTROPHON PEREGRINUS, new species.

Shell small, yellowish white, with eight whorls; nucleus rounded, smooth, tilted, with a whorl and a half; subsequent whorls with seven or eight procumbent broad varices, strongly angulated at the shoulder, where the varices form compressed elevated spines; behind the angle the whorl is somewhat excavated; base of the whorl constricted with a short, recurved, imbricate canal; aperture squarish, white within; surface with fine spiral striation; lon. of aperture and canal 12, of shell 23 mm.; max. lat. 11 mm.

Dredged off Catalina Harbor, Santa Barbara Islands, California, in 16 fathoms, gravel, by W. H. Dall in 1873.

This pretty little species strongly recalls the Japanese *Trophon candelabrum* Adams and Reeve, but differs in being relatively stouter and shorter, with procumbent instead of erect varices, a shorter canal, an absence of the brown painting of the Japanese species, and the presence of spiral striation. From *B. multicostatus* Eschscholtz it differs in color and varical sculpture, having also a proportionately shorter spire. The varices are so broad and procumbent that, when they are unbroken, the varix covers not only the interspace in front of it but also part of the next varix, but without adhering to the whorl.

BOREOTROPHON MULTICOSTATUS Eschscholtz.

This is the *Fusus multicostatus* Eschscholtz, 1829, the *Trophon gunneri* and *Polyplex gracilis* of Carpenter, 1863, not of Lovén, 1846, or Perry, 1811. It has been generally consolidated with *B. gunneri* or *B. clathratus* by authors. It is certainly near to *B. gunneri*, which is the later name, but I am inclined to believe it distinct. The typical *B. gunneri* of Lovén has a smaller and less solid shell, with a larger average number of varices and less tabulated whorls, above which the varical spines are more elevated. I have never seen among the Atlantic shells the livid brown throat which is so general in those from the Pacific. In the latter the canal is stouter, relatively shorter and wider. G. O. Sars gives as an average length for *B. gunneri* 21 mm.; among adult *multicostatus* a length of 36 mm. is not uncommon,

though both species have the same number of whorls. At any rate, if either name is to be changed the Atlantic species will have to take Eschscholtz's name.

The geographical range of this form is from the north end of Nunivak Island, Bering Sea, on the verge of the arctic fauna, south to Mendocino County, California, in 2 to 50 fathoms; also on the northern coast of Japan in 3 to 43 fathoms. Some of the Japanese specimens collected by Capt. St. John, R. N., measure 46 mm. in length, with six whorls and nine varices.

BOREOTROPHON BERINGI, new species.

Shell greenish white, elegantly ovate-fusiform, with a rather elongated curved canal, the aperture and canal longer than the spire; whorls with the base gradually attenuated, not constricted, about six in number, with a distinct but not deep suture and 9 to 12 low sharp rounded varices, with no obvious angle at the shoulder; surface with fine revolving striation, sometimes partly obsolete; aperture white; long., 40; max. lat., 17; long. of spire above aperture 16 mm. Operculum dark brown.

The geographical range of this species is from the north end of Nunivak Island, Bering Sea, to Cook's Inlet on the southeast and northern Japan on the southwest in 2 to 81 fathoms. U.S.N.M. 109051.

This is the shell regarded by Jeffreys, Adams, and Carpenter as *B. clathratus* in the north Pacific area; but if well-developed adult specimens be compared it will be seen that they are really not very similar. The young *B. beringi* are notably short and broad, and often show a pinkish tint with the varices whiter.

BOREOTROPHON PACIFICUS, new species.

This species resembles the preceding in miniature except that it has, with the same number of whorls, closer and more numerous varices, and the throat is sometimes pale brownish. The varices number from 15 to 20, and the largest specimens measure from 20 to 27 mm. in length. The average length appears to be about an inch when adult. The species is the faunal analogue of *B. truncatus* Ström, of the Atlantic fauna, but differs from it by the absence of the spiral sculpture and larger size.

The geographical range of *B. pacificus* is from the Sea Horse Islands, in the Arctic Ocean, south through Bering Sea and along the coast of Alaska as far as Sitka Harbor, in 5 to 60 fathoms. It is the commonest Pacific coast species, and has been called by Dr. Carpenter *Trophon scalariformis* on his labels, but it is not the *scalariformis* of Gould. Jeffreys labeled it usually as *Trophon truncatus*. U.S.N.M. 109100.

BOREOTROPHON DISPARILIS Dall.¹

This was described in 1891, from 52 to 77 fathoms, in the vicinity of Grays Harbor, Washington, and extends down the coast in deep water to the San Pedro channel. Possibly a *Trophonopsis*.

BOREOTROPHON TRIPHERUS, new species.

Shell small, thin, delicate, white, with a thin yellowish periostracum and about five whorls; nucleus eroded in all the specimens; early whorls tabular, with about 14 low, sharp varices, sharply angulated, but hardly spinose on the shoulder, and growing feebler on the subsequent whorls; below the shoulder are three feeble spiral threads which slightly undulate the varices; these threads grow feebler with age, and are hardly perceptible on the last whorl; aperture ovate, passing into the long, slightly twisted canal, which is strongly recurved; suture very distinct; outer lip thin, deeply flexuous behind; pillar thin, attenuated in front, twisted, with a pervious axis; operculum normal, pale brown; lon. of shell 22.5; of spire without the nucleus 7; max. lat. of shell 9 mm.

Dredged on the northwest coast by the U. S. Fish Commission steamer *Albatross*, off Destruction Island, State of Washington, in 516 fathoms, mud, at station 3343, bottom temperature 38°.2 F.; and at station 3346, off Tillamook Bay, Oregon, in 786 fathoms, bottom temperature 37°.3 F.; U.S.N.M. 109044 and 109045.

This interesting species belongs to the same group as *B. scitulus* Dall, and *B. disparilis* Dall, but is abundantly distinct from either of them. The development of spines, as in the former, is not a character of deep systematic import, and sometimes varies widely in different individuals of the same species. These may perhaps belong in *Trophonopsis*.

BOREOTROPHON ALASKANUS, new species.

Shell creamy white with a more translucent substratum, the nucleus eroded, and five subsequent whorls; the whorls are rounded and bear eight narrow varices which are only prominent at the shoulder where they rise into long blunt spines which curve backward and somewhat toward the axis of the shell; there is no spiral sculpture, the incremental lines are not conspicuous, but magnification shows the surface when not eroded to be covered with a fine, saggrinate or subgranular sculpture, unlike anything I have noted on other species. The spire is elevated, the suture very distinct, the canal slender, long, and strongly curved; the aperture is subovate, the pillar white and polished, the outer lip thin and slightly patulous opposite the base of the pillar; alt. of shell 32; of spire (nucleus missing) 12; max. diameter of shell, exclusive of the spines, 14 mm. Operculum normal, dark brown.

¹ Figured in Proc. U. S. Nat. Mus., XVII, 1895, pl. xxvii, fig. 4.

Dredged by the U. S. Fish Commission steamer *Albatross* in Bering Sea north of Unalaska, at station 3227, in 225 fathoms, mud, bottom temperature 38° 6 F.; U.S.N.M., 122594.

The peculiar muricoid spines and sagriate surface sufficiently distinguish this from any of the other species of the region, though it has a general superficial resemblance to those of the *clathratus* type.

BOREOTROPHON MAZATLANICUS, new species.

Shell small, thin white with a thin grayish periostracum and five or more whorls; whorls with a strong peripheral carina in front of which, equidistant, are two feeble spiral cords; axial sculpture of fine, sharp, close-set low lamellæ, extending over the whole whorl, sparser on the early whorls; suture distinct, not channelled, the whorl in front of it sloping, rooflike; canal rather straight, but broken in the unique type, length of three whorls without the canal 7; max. lat. 5 mm.

Dredged by the U. S. Fish Commission steamer *Albatross* at station 3431, off Mazatlan, Mexico, in 995 fathoms, mud, bottom temperature 37° F.; U.S.N.M., 123022.

This is evidently a *Boreotrophon* though the sculpture is so unusual, the varices being reduced to low close-set lamellæ. Although decoliate and with the canal broken off it seemed too remarkable a shell to ignore.

BOREOTROPHON PANAMENSIS, new species.

Shell thin, white, slender, elongate, with the spire shorter than the canal and aperture; whorls five or more, nucleus eroded; subsequent whorls with two or even three low revolving cords between the sutures and two fainter ones on the base, one of which may be obsolete; axial sculpture of rather coarse close-set elevated lines of growth, which on the early whorls are sparser and stronger, forming a more or less irregular reticulation with the spirals, the posterior of which is the shoulder, the space between it and the sutures is slightly convex and rather wide; aperture kite-shaped, rather small; the canal very long and wide, the pillar somewhat twisted and anteriorly obliquely attenuated. Lon. of aperture and canal 11.5; of shell 18.0; max. lat. 6.5 mm. Another specimen is 22 mm. long.

Dredged in the Gulf of Panama by the U. S. Fish Commission steamer *Albatross* at station 3392, in 1,270 fathoms; bottom temperature 36° 4 F.

This species is related to the preceding and also to *B. disparilis*. Perhaps both should be placed in *Trophonopsis*.

BOREOTROPHON AVALONENSIS, new species.

Shell small, delicate, white, fusiform, with 1½ nuclear and five subsequent whorls; nucleus tilted, rounded, smooth; subsequent whorls finely spirally striated, with eight or nine sharp, appressed varices rising into radiant, narrow-grooved spines at the shoulder; suture very

distinct, aperture subovate, canal moderate, more or less recurved, pillar twisted, anteriorly attenuated; base hardly constricted; long. of shell 16.5, of aperture and canal 10.0; max. lat. 8 mm.

Dredged off Avalon, in the Santa Barbara channel, California, by the U. S. Fish Commission steamer *Albatross*, at station 3664, in 80 fathoms, sand, bottom temperature 50° F.; U.S.N.M., 109109.

B. (AVALONENSIS variety?) EUCYMATUS Dall.

Shell not spiny at the shoulder, larger, with 15 to 18 varices, hardly raised and barely angular at the shoulder; long. 27; max. lat. 9.5 mm.

Dredged at station 2935, in 124 fathoms, off San Diego, California; bottom temperature 49° 2 F.; U.S.N.M., 109087.

A still more slender specimen has only 7 varices, and is somewhat intermediate between the type and the variety. It is a common thing for the aspinose variety of any species of *Boreotrophon* to have a greater number of varices than the spiny form, in harmony, perhaps, with some law of secretion.

BOREOTROPHON ROTUNDATUS, new species.

Shell small, with rather short spire and five or more fully rounded whorls; nucleus eroded; subsequent whorls with (on the last) about 14 keeled ribs, angular, but not spinose, at the shoulder, passing over the whorl to the base; spiral striation obsolete or none; aperture subovate, yellowish within; canal moderate, recurved; lon. of shell 16; of aperture and canal 10; max. lat. 7 mm.

Dredged in Bering Sea, southeast from the Pribilof Islands, by the U. S. Fish Commission steamer *Albatross* at station 3609, in 74 fathoms, mud and sand, bottom temperature 38° F.; U.S.N.M., 149614.

I am unable to unite this pretty little shell with any of the other species. It is, perhaps, most similar to the *B. cepula* Sowerby, var. *cymatus* Dall, a much larger shell. It differs from nearly all the other species in having the varices represented by stout ribs, and not by a sharp lamina or imbrication.

BOREOTROPHON CEPULA Sowerby.

This is the shell described in 1880 in the *Thesaurus Conchyliorum*, and regarded as the *Fusus lamellosus* Gray, 1839, a specific name pre-occupied in both *Fusus* and *Trophon*. The true *lamellosus* of Gray is a variety or mutation of *Boreotrophon dalli* Kobelt, and not the species now under consideration. *B. cepula* is found in from 41 to 85 fathoms in Bering Sea north of Unimak Island, and in the Pacific south of Unimak; also dredged by Captain St. John in 48 fathoms on the north coast of Japan.

The same species has been received from Pleistocene terraces on the shores of Volcano Bay, Japan, collected by Pumpelly. It has from

14 to 20 sharp laminose varices, more or less angular and rarely spinose at the shoulder; there is a marked descent from the suture to the shoulder in typical examples. The shell is usually finely spirally striated and has about five whorls and an average length of 30 mm.

This somewhat resembles small specimens of *B. dalli*, but with care is easily discriminated, especially by its more fusiform outline.

A variety *cymatus* has the angle obsolete and the whorls rounded; it was dredged in 71 fathoms west of the Pribilof Islands, Bering Sea, by the U. S. Fish Commission steamer *Albatross*. U.S.N.M., 109091.

BOREOTROPHON DALLI Kobelt.

This is the *Fusus lamellosus* Gray, 1839, the *Trophon muriciformis* Dall, 1877, and the *Trophon dalli* of Kobelt, 1878. In 1880 Sowerby figured it under the name of *Trophon gooderichi*, having found it in the British Museum labeled *T. goodridgei* by Forbes, a name unpublished. He also confounded it with *T. coronatus* A. Adams, a much smaller species. It is not the *Trophon muriciformis* of King, 1831, nor the *T. lamellosus* of Gmelin. The present species has been figured.¹

The distribution of this shell is known to extend from Cape Franklin in the Arctic Ocean south through Bering Sea and into the Pacific, where it has been dredged to the eastward of Sannak reefs, in 32 to 71 fathoms by the U. S. Fish Commission steamer *Albatross*.

A variety with the spines obsolete, the shoulder of the shell sloping, and the canal short is the original of Gray's *F. lamellosus*. There is one in the National Museum from which his figure might have been drawn.

Another variety, *altus*, has the spire exceptionally elevated.

The chief peculiarity of this species, apart from its muricoid form, is the appearance of the spines on the shoulder, which vary in number from 15 to 21, and which often have an appearance as if they were independent of the varices and had been separately stuck on to the whorl.

There are usually five whorls, exclusive of the nucleus, and full-grown specimens reach about 60 mm. in length. The spire and long canal are frequently distorted, and the aperture, usually white, is sometimes internally tinged with yellow.

Section **AUSTROTROPHON** Dall, 1902.

TROPHON TRIANGULATUS Carpenter.

This shell was named by Carpenter in 1863, and more fully described from a very young specimen in 1865. Later Mrs. Oldroyd and Miss Hale discovered the adult at San Pedro, and after a careful study of

¹ New edition of the Conchylien Cabinet, *Fusus*, pl. cxxiv, fig. 1, and also in the Proc. U. S. Nat. Mus., IX, 1886, pl. iv, fig. 6.

them I identified the species with Carpenter's immature type and figured both.¹ It is always a little difficult to be certain about such identifications, as the young of various species are very much alike, but in this case both have the same form, color, and seven varices, and after reviewing the matter I see no reason for changing my original opinion. So far this species is only known from San Pedro Channel and Catalina Island in 30 to 90 fathoms. The adults are large, solid, and strong, of a streaked brown color, with seven varices, usually more or less chipped, the spinose prolongations wavy and more or less twisted and often very long. There is an obsolete spiral striation and five or six whorls. The shell is much attenuated toward the canal, and reaches a length of about 100 mm. It has been obtained through the fishermen in considerable numbers.

TROPHON CERROSENSIS Dall.

This is a considerably smaller shell, more delicate and with more numerous varices. It is of the same general type as the preceding, but has well-marked spiral threading, about ten varices, and, with the same number of whorls, measures only about 40 mm. in length. It is of a yellowish color, and has been dredged near Cerros Island, Lower California, in 9 to 48 fathoms. It is figured.² U.S.N.M., 97072. The young shells are quite different from the young *B. triangulatus*, being decidedly more slender and longer, with the same number of whorls.

TROPHON PINNATUS, new species.

Shell large, thin and delicate, with a low spire, seven to ten broad thin varices much expanded near the canal and elongated into spines at the shoulder; surface with fine incremental and obsolete fine spiral striation; there are about five whorls beside the nucleus, which between the suture and shoulder are tabulate; the spines resemble those of the two preceding species; the aperture is rounded, with a long, wide, open canal, a strongly marked more or less imbricate siphonal fasciole, and a deep umbilical perforation; the color is white, pale brown, or more or less spirally banded brown or yellowish white. Long. 80; of aperture and canal 45; max. lat. (including spines) 57 mm.

Dredged in Magdalena Bay and near Point Abreojos, Lower California, by the U. S. Fish Commission steamer *Albatross* at stations 3040, 3043, and 3045, in 21 to 74 fathoms.

This fine species belongs to the same group as the two preceding, and may be distinguished from *B. triangulatus*, which is nearest to it, by its more numerous varices and their wide expansion anteriorly, its deeply perforate axis, and the absence of the anterior attenuation, which is so noticeable in that species. It is also of a lighter and more

¹Proc. of the U. S. Nat. Mus., XIV, 1891, pl. v, figs. 1, 3, and 6.

²Idem, pl. v, figs. 5 and 7.

yellowish color. The operculum is like that of the Magellanic Trophons, purpuroid, and not like that of the Boreotrophons, which is fusoid.

This concludes our review of this interesting group, to which we may expect many species to be added when the deeper waters along the continental margin are more thoroughly explored.

TYPHIS MARTYRIA, new species.

Shell small, solid, reddish brown, with about six whorls; each whorl carries four varical nodes, the long anal tubule in each case nearer to the varix behind it than to the one in front; at the shoulder is a keel, between which and the suture the whorl is deeply excavated; the early varices are nodular but the final varix is expanded, recurved, convex in front, excavated behind, with a recurved spine at the shoulder, and slightly crenulated at the outer margin; below the aperture the varix is very broad, filling the space between the curved canal and the aperture; nucleus lost; surface of the whorls nearly smooth, with faint incremental lines and elevated lines on the final varix radiating from the aperture; the latter is small, nearly a regular oval, with a continuous raised margin; aperture internally white with four narrow brown spiral lines near the edge; canal wholly closed, long, slender; operculum normal; long. of shell 27; diam. of shell 14; of aperture 4 mm.

Dredged in the Gulf of California, off the island of San Pedro Martir, in 14 fathoms, sand, by the U. S. Fish Commission steamer *Albatross*, at station 3013, bottom temperature 65° F. U.S.N.M. 130629.

This curious little shell belongs to the typical section of the genus, and is most nearly allied to *T. quadratus* Hinds, from Guayaquil. The latter is a shorter and wider species, which attains only a smaller size.

PEDICULARIA CALIFORNICA Newcomb.

Plate XXXVIII, fig. 5.

Pedicularia californica NEWCOMB, Proc. Cal. Acad. Sci., III, 1864, p. 121; IV, 1872, pl. I, fig. 9.

Farallones Islands, California, and south to Monterey, attached to the stems of Gorgonians. U.S.N.M., 56469.

This beautiful shell is white, clouded with deep rose color, and is more or less modified in form by the surface to which it clings.

ANAPLOCAMUS BOREALIS Dall.

Plate XXXVIII, fig. 4.

Anaplocamus borealis DALL, Proc. U. S. Nat. Mus., XVIII, 1895, pp. 8-9.

Pacific Ocean, south of Unimak Island, Alaska, in 61 fathoms, muddy bottom, U. S. Fish Commission steamer *Albatross*. U.S.N.M., 122592.

This singular shell is bluish white with an olivaceous brown periostacum, and is usually more or less eroded. In the adult there seems to be a patch of darker color on the body just outside the callus. Its resemblance to a fresh-water shell is obvious, but pending an anatomical examination it is provisionally referred to the vicinity of *Trichotropis*.

LITORINA ALEUTICA Dall.

Plate XXXIX, figs. 4, 6.

Litorina aleutica DALL, Proc. Cal. Acad. Sci., IV, 1872, p. 271, pl. I, figs. 3, 3a.

Gull Rocks in Akutan Pass, and on wave-worn rocks at Nazan Bay, Atka Island, Aleutians, Dall. U.S.N.M., 130623.

The shells are mostly yellow brown, sometimes with lighter bands, the throat dark, and the broad pillar white, with a minute umbilical perforation.

LITORINA ATKANA, new species.

Plate XXXIX, fig. 11.

Western Aleutians, from Atka Island westward. Figured specimen from shore of Little Kyska Island, Kyska Harbor. U.S.N.M., 108986, 108987.

Typical form of shell large, solid, nearly smooth, the whorls flattened next the suture, a few obsolete striations on the base, the general form as figured, the outer lip thin, the pillar broad and white. Alt. 20.0, lat. 17.0 mm.

The most abundant form is of a dark chestnut brown throughout, except on the pillar. The variety figured has white bands at the suture, periphery, and umbilical region. These bands do not vary in position.

A third mutation, which involves both the preceding color forms at times, has the spiral sculpture stronger and more extended over the surface, though it never reaches the prominence sometimes attained in *L. sitkana* Philippi, which is a much smaller shell without the broad white pillar. The periostacum, usually not very conspicuous, is sometimes of a light yellow brown and dense enough to obscure the underlying white bands.

I have recognized and distributed this species under the above name for some years, but I believe, by some inadvertence, it has never been formally described.

AMAUROPSIS PURPUREA Dall.

Plate XXXVIII, fig. 9.

Amauropsis purpurea DALL, Am. Journ. Conch., VII, Pt. 2, 1871, p. 124, pl. xv, fig. 16.

St. Michael, Norton Sound, Alaska, and northward to Point Barrow. U.S.N.M., 108988.

Shell purplish, with the callosities of the aperture white, and an adherent periostracum of olive, more or less streaked with brown, sometimes with black stains. This species differs from the smaller and more slender *A. islandicus* Gmelin, with which it has sometimes been confused, by its color, the persistency of its periostracum, and its distribution. *A. islandicus* is not known from the Alaska region or the adjacent Polar sea, it is white invariably and the periostracum is caducous. It reaches a height of 25 mm., but *A. purpurea* attains nearly 50 mm.

CALLIOSTOMA VARIEGATUM Carpenter.

Plate XXXIX, fig. 10.

Calliostoma variegatum CARPENTER, Proc. Acad. Nat. Sci. Phila. for 1865, p. 61.

Puget Sound and south to San Pedro Channel, California, in 30 to 60 fathoms. U.S.N.M., 122567.

This species was described from a young shell dredged by Dr. Kennerley, and only a quarter of an inch (6 mm.) in height. It has long remained unique, but of late years the U. S. Fish Commission and the seaside laboratory of the University of California at San Pedro have obtained adult specimens which reach a height of 28 mm. and a width of 26 mm. The adolescent shell has the apical whorls rose color, the rest yellowish white, with the alternate spirals stronger, and articulated with madder brown both on the spire and the base. As the shell gets fully adult the color becomes less lively and the articulation less distinct, so that the general tone of the shell appears to be of a yellowish pink with indications of the nacre shining through.

CALLIOSTOMA TURBINUM Dall.

Plate XXXIX, fig. 1.

Calliostoma turbinum DALL, Proc. U. S. Nat. Mus., XVIII, 1895, p. 8.

Off Point Conception, California, and eastward to San Diego in 100 to 500 fathoms, U. S. Fish Commission. U.S.N.M., 122578.

Shell small, turbate and thin, the nacre shining with a peculiarly coppery luster, the apex white, the periphery painted with purple-brown flammules and the spirals more or less articulated with the same color. The pillar is white. No attempt has been made in the figure to express the color markings.

CALLIOSTOMA IRIDIUM Dall.

Plate XXXIX, fig. 3.

Calliostoma iridium DALL, Proc. U. S. Nat. Mus., XVIII, 1895, p. 7.

Off Panama, in 127 fathoms sand, bottom temperature 56° F., U. S. Fish Commission steamer *Albatross*. U.S.N.M., 122957a.

Color of the shell pinkish waxen, the apex somewhat darker, with variable delicate brown flammules, and darker brown ones on the periphery of the last whorl. The base is destitute of flammules, and the pillar is white. These delicate colors in this as in most shells tend to fade somewhat in the cabinet.

GIBBULA CANFIELDI Dall.

Plate XXXIX, fig. 2.

Gibbula canfieldi DALL, Am. Jour. Conch., VII, 1871, p. 129.

Monterey, Dall; Santa Barbara, Button. U.S.N.M., 162005.

The color of the shell is pearly with bronze-yellow pencilings obliquely to the suture. The original type was long inaccessible, but another specimen was obtained by Mr. Button, and it also occurs in the Pleistocene. Only two recent specimens are known.

SOLARIELLA CARLOTTA, new species.

Shell rather depressed, pearly white covered with a dense, rather fibrous, olive-gray periostracum; nuclear whorls eroded, but the shell exhibits about four and a half whorls; sculpture of, on the base eight minutely distantly nodulous spiral threads stronger and more distant as one proceeds from the verge of the umbilicus to the periphery; peripheral spiral separated from another above it by an excavated channel; these two are the strongest on the shell, and between the upper one and the suture is another much feebler thread; the upper two are all that show on the spire, as the outer lip runs just above the peripheral thread; the radial sculpture comprises incremental lines, and on the last whorl about twenty low narrow somewhat oblique riblets about a millimeter apart, extending from the suture to the first peripheral keel, but not beyond; these riblets nodulate the weak spiral, but are only about half as numerous as the nodules on the peripheral spirals; suture distinct, not channeled; base rounded; the umbilicus funicular, of moderate size, bounded by an inconspicuous keel, above which the walls are vertically striated; margins of the aperture simple, sharp, the upper lip advancing where it joins the body; pillar lip thin, slightly excavated, the distal angle not prominent. Alt. 9.0; max. diam. 13.5 mm.

Dredged at station 3342, off the Queen Charlotte Islands, in 1,588 fathoms, ooze, bottom temperature $36^{\circ}.3$ F., by the U. S. Fish Commission steamer *Albatross*. U.S.N.M., 109020.

This species resembles in its type of sculpture *S. actinophora* of the Antilles; the general appearance is dull and unattractive. Only a single individual, tenanted by a small hermit crab, was obtained.

GANESA ? PANAMENSIS, new species.

Shell rather large for the genus, evenly, roundly turbinate, the nucleus lost, with about two and a half subsequent inflated whorls; suture distinct, the whorl in front of it narrowly marginate; surface smooth, except for fine incremental lines, polished, with about ten faint grooves around the very narrowly perforate umbilicus; aperture rounded, simple, the outer lip sharp, the inner arcuate and slightly thickened, the body with a thin callus; operculum pale horn color, with about five whorls; the foot of the animal rather short, with several pseudopodial lateral rather stout filaments. Alt. of shell 4.5; max. diam. 4.75 mm.

Dredged by the U. S. Fish Commission steamer *Albatross* in the Gulf of Panama at station 3393, in 1,020 fathoms, mud; bottom temperature 36° 8 F. U.S.N.M., 109029.

I have been somewhat puzzled where to place this little shell, which appears to agree in general form very well with *G. nitidiuscula* Jeffreys, as figured in the Proceedings of the Zoological Society of London for 1883. I have not seen this species; the other of the two originally described by Jeffreys is very distinct, having a continuous peritreme and the last whorl near the aperture often entirely free from the preceding whorl, while the surface is finely granular. This form I named *Granigyra*, of which there are half a dozen species. I may add that the figure of *Ganesa* (*Granigyra*) *pruinosa* Jeffreys, in the publication above referred to, is exceedingly bad, as it agrees neither with the diagnosis given by Jeffreys nor with his specimens. I do not think that the interruption of the peritreme by the surface of the penultimate whorl is a systematic character of great importance, since many species show this interruption in youth and have a complete peritreme later; and sometimes even adult specimens appear to vary in this respect in the same species. Miss Bush's useful paper hardly carries the subject far enough to resolve all doubts. The distinction between her genus *Lissogyra* and the older *Ganesa*, as above restricted, is not very clear. But until we know more of the anatomy of these small creatures, there will, doubtless, be always more or less uncertainty about them. For the present, I shall refer this species to *Ganesa* provisionally.

MARGARITES VORTICIFERUS Dall.

Plate XXXIX, figs. 7, 8.

Margarita vorticifera DALL, Proc. Cal. Acad. Sci., V, 1873, p. 59, pl. II, figs. 4a-b.

Southern portion of Bering Sea, Akutan Pass, and westward to Atka Island, Aleutians. U.S.N.M., 126758.

The shell is of a salmon pink color varying in depth with the individual and its state of preservation. It is a characteristic member of the Aleutian subfauna.

ZEIDORA FLABELLUM Dall.

Plate XXXVIII, fig. 8.

Emarginula flabellum DALL, Proc. U. S. Nat. Mus., XVIII, 1895, p. 10.

Off Clarion Island, Lower California, in 460 fathoms, sand, at station 2992, U. S. Fish Commission. U.S.N.M., 122577.

The shell is subtranslucent white. It was crushed by the trawl and the fragments held in place by the soft parts when received, so that it seemed unwise to attempt to free the pieces from the animal and the narrow "deck" of the limpet was not discovered. More study and careful examination revealed the true genus, to which it is accordingly transferred. It is the first west coast species of the genus. The corrected measurements are: Lon. 12.5; lat. 7.75; alt. 3.25 mm.

SUBEMARGINULA YATESI Dall.

Plate XXXVIII, figs. 1, 3.

Subemarginula yatesi DALL, Nautilus, XIV, No. 11, Mar., 1901, p. 125.

Monterey, California, Dr. L. G. Yates. U.S.N.M., 162062.

The shell is rude and of a whitish color, somewhat tinged with greenish olive. The furrow and shallow anterior sinus point a little to the right of the median line of the shell. It was obtained from a dealer in shells at Monterey, who told Dr. Yates that he got two or three living specimens from stones brought up in the fishermen's nets in the Bay of Monterey. It is a near relative of *S. gigas* Martens of Japan.

LEPIDOPLEURUS MESOGONUS, new species.

Chiton of moderate size, yellowish or ashy white, with a narrow girdle dusted with very minute spicules; valves laterally compressed, almost keeled at the jugum, and with the sides meeting there at an angle of 69°, slightly rounded at the junction; body narrow, ctenidia about a dozen on each side, the most anterior even with the front edge of the seventh plate; anterior valve simple, without insertion plates, sculptured with moderately strong concentric resting stages and fine, low, close-set rounded pustules; posterior plate large, similarly sculptured, with a prominent mucro nearer the posterior than the anterior edge of the plate, the anterior and posterior areas hardly defined; intermediate valves with the lateral areas more or less irregularly concentrically ridged, the pleural and jugal tracts less distinctly so, the whole covered with uniform pustulation and the inner areas defined very obscurely by faint depressions; though angular, the jugum is not beaked anteriorly. Lon. of animal about 35; lat. (with dry girdle) 9; alt. 6 mm.

Dredged by the U. S. Fish Commission steamer *Albatross* in the Pacific, off the Queen Charlotte Islands, British Columbia, at station 3342, in 1,588 fathoms, ooze, bottom temperature 35.3° F.; U.S.N.M., 109019.

This species is remarkable for the sharp angle made by the planes of its valves and for the absence of any regional differentiation of its minor sculpture. It is somewhat unusually large for the genus.

LEPIDOPLEURUS HALISTREPTUS, new species.

Chiton in general rather similar to the last species and best described by a differential diagnosis. The girdle is closely and profusely minutely spinulose; the scales, being longer and more dense, do not give the dusty effect of those of *L. mesogonus*; the valves are rounded above, without well-defined lateral areas or notable concentric rugosities; their mesial angle is about 104°; the minute pustulation is smaller and rather more prominent; in the posterior valve the mucro is depressed and the areas even more feebly defined; internally the valves are callous, the sutural laminae small and subtriangular, the laminae of insertion wholly absent and the girdle attached to a surface merely a little rougher than the rest. Lon. of animal about 35; lat. 10; alt. 4.5 mm.

Dredged by the U. S. Fish Commission steamer *Albatross* off Acapulco, Mexico, at station 3415, in 1,879 fathoms, mud, bottom temperature 36° F. (U.S.N.M., 109032), and station 3418, in 660 fathoms, bottom temperature 39° F.; U.S.N.M., 109031.

The rounded back of this species immediately separates it from *L. mesogonus*, a conclusion which the minor characters confirm. In the alcoholic specimen the line of the ctenidia extended forward to the anterior edge of the fifth valve.

LEPIDOPLEURUS LURIDUS, new species.

Chiton small, solid, narrow, of a lurid smoky color, darker on the lateral areas; girdle densely pilose, with whitish spicules; back rounded, with the jugum defined feebly, most conspicuous as a distinct mucro, mesially, on the intermediate valves; pleural areas divided by obscure depressed lines radiating from the mucro to the inner edges of the pleural laminae; lateral areas prominent, more or less concentrically rugose; anterior valve simple, normal; posterior valve with a conspicuous central mucro, behind which it is more or less concave; the whole surface is covered with minute, quincuncially arranged pustulation; on the intermediate valves the pustules on the lateral and pleural areas appear to diverge from the inner margin of the lateral areas; internally there is a wide unattached margin on the under side of the posterior edge, mesially, in the intermediate valves; the pleural laminae are short and all the valves callous internally, with the points of attachment to muscles and girdle impressed; there is no linear

arrangement of the pustules on the jugum; the ctenidia only reach the seventh valve. Lon. of animal about 16; lat. 6; alt. 3 mm.

Dredged in Panama Bay by the U. S. Fish Commission steamer *Albatross*, at station 3393, in 1,020 fathoms, mud, bottom temperature 36.8° F.; U.S.N.M., 109027.

In the solidity of its valves, its mucronate jugum, and the arrangement of the pustular sculpture this seems sufficiently distinct from any of the described species.

LEPIDOPLEURUS FARALLONIS, new species.

Chiton small, thin, wide, with a low rounded back and yellowish-white color; girdle narrow, sparsely spiculate, with very short, fine, bristly spicules; jugum hardly defined, with no obvious mucro; lateral areas slightly elevated and feebly concentrically rugose; anterior valve simple; posterior conspicuously mucronate and, behind the mucro, concave; surface entirely covered with minute, low, close-set pustules, arranged quincuncially and to some extent concentrically from the mucronal points; pleural laminae short, subtriangular; ctenidial line reaching the fifth valve. Lon. of animal about 10; lat. 5.5; alt. 2 mm.

Dredged by the U. S. Fish Commission steamer *Albatross* off the Farallones Islands, near San Francisco, California, at station 3104, in 391 fathoms, coral, bottom temperature 41° F.; U.S.N.M., 109025.

This little species has no very striking characters, but, having been compared with all the boreal and Pacific species hitherto recorded, it was found not to be identical with any of them.

ISCHNOCHITON STEARNSII, new species.

Chiton of moderate size, yellowish or buff color; the girdle yellowish-white, covered with subcylindric, blunt, smooth, close-set, large spines, the ends of which have a pebbly appearance, mixed with a smaller proportion of small but rather similar spinules; the ends of the large spines, when worn flat, have a pavement-like aspect; back not keeled, but rather steeply rounded; gills ambient; intermediate valves with a dorsal angle of about 90°, the lateral areas prominent, with about five radial riblets in each, divaricating to seven or ten at the girdle margin, and cut into beads by numerous fine concentric furrows; pleural areas and jugum hardly differentiated, sculptured with fine, slightly irregular, longitudinal wrinkles, finer mesially, crossed by inconspicuous, less elevated transverse lines; anterior valve with fine, beaded, divaricate radial riblets, the insertion plates and eaves very short, smooth, not spongy, with about 17 slits; the posterior valve with a small, low, subcentral mucro, from which two elevated lines extend to the margin, one on either side, forming two areas, and from which the wrinkled sculpture, less prominent on the anterior area, diverges; posterior

slits about 15, lateral slits 2; sinus rather wide, entire; pleural laminae rather wide and short. Lon. of animal about 25; lat. 15; alt. 6 mm.

Dredged by the U. S. Fish Commission steamer *Albatross*, at station 3104, off the Farallones Islands, in 391 fathoms, coral, bottom temperature 41° F. U.S.N.M., 109024.

This species has somewhat the aspect of *Trachyradsia*, but presents such a mingling of characters that I am in doubt as to which section of *Ischnochiton* would best receive it.

ISCHNOCHITON SARCOSUS, new species.

Chiton rather elongate, marbled with scarlet and white, paler mesially, rather low and not carinate; the girdle densely set with small, curved, smooth bristles of different sizes, dark red and white mixed; underside of the girdle chocolate color, and the interior of the valves flesh pink; dorsal angle somewhat more than 110°, the jugal region being rounded off; intermediate valves with prominent lateral areas hardly concentrically or radially sculptured, but finely punctate all over and more or less serrate near the girdle on the posterior margin; jugum not defined, central area of the valves longitudinally sculptured with low inosculating wrinkles which sometimes form diamond-shaped interstitial excavations; the whole sculpture has an obsolete appearance; anterior valve finely punctate, feebly concentrically sculptured; posterior valve the same, with a low subcentral mucro as in *I. magdalensis*; anterior valve with about 8, posterior about 10 slits, intermediate valves with 2 slits; sinus wide, entire; pleural laminae, wide, short; lon. in the dry state 36, lat. 15, alt. 5 mm.

Dredged in 30 fathoms off San Martin Island, Lower California, by Dr. Fred Baker, of San Diego, and also collected at Portuguese Bend, near San Pedro, California, by Mr. T. S. Oldroyd. U.S.N.M., 109043.

This is an attractive species on account of its fine coloration. It would probably go best in Carpenter's section *Maugerella*, differing from *Stenoradsia* by the elongate bristly armature of the girdle.

PELECYPODA.

LEDA HAMATA Carpenter.

Plate XL, fig. 9.

Leda hamata CARPENTER, Suppl. Rep. Brit. Assoc., 1864, pp. 98, 130; Proc. Cal. Acad. Sci., III, Feb., 1866, p. 210.

Near Catalina Island, California, in about 50 fathoms. U.S.N.M., 107420.

Shell small, compressed, and of a dark chestnut brown. I have figured most of the *Ledidae* of the present northwest American fauna in the Bulletin of the Natural History Society of British Columbia,¹ and now add to them this interesting but hitherto unfigured species.

¹ No. 2, January, 1897.

PECTEN RANDOLPHI Dall.

Plate XL, fig. 2.

Pecten randolphi DALL, Nautilus, XI, No. 8, Dec. 1897, p. 86.

Occurring in deep water from Bering Sea to west Mexico, in from 225 to 1,005 fathoms, U. S. Fish Commission steamer *Albatross*. The figured specimen is from west of Destruction Island, State of Washington, in 516 fathoms, bottom temperature 38° F. U.S.N.M., 107749.

The shell is subtranslucent white, glassy, and extremely thin. It belongs to the section *Pseudamysium*.

PECTEN DAVIDSONI Dall.

Plate XL, figs. 5, 6.

Pecten davidsoni DALL, Nautilus, XI, No. 8, Dec., 1897, p. 86.

Bering Sea and the Aleutian Islands and eastward to Kadiak Island, Alaska, in 280 to 351 fathoms. U.S.N.M., 107747.

Shell waxen white, having the aspect of a *Propeamysium* externally, but really belonging in the section *Pseudamysium*. It is named in honor of Prof. George Davidson, the distinguished geographer and astronomer of San Francisco, California.

CRENELLA MEGAS, new species.

Shell elongate-oval, inflated, thin, white, slightly perlaceous internally; beaks small, low, anteriorly directed; surface very closely, finely, evenly, radially threaded, the threads crossed by fine, less obvious, incremental lines emphasized at the resting stages; margins very finely crenulate internally; ligament long, produced within the hinge line to the apex of the beaks, seated on a very thin elongate nymph, which in the absence of the ligament looks like a long lateral tooth or lamina; hinge line interrupted by the ligament; muscular impressions obscure. Alt. 25.5; lat. 17.0; diam. 16.5 mm.

Dredged at station 2795, in Panama Bay, at a depth of 33 fathoms, sand, bottom temperature 64° F., by the U. S. Fish Commission steamer *Albatross*. U.S.N.M., 96256.

This is by all odds the largest *Crenella* known. It is very delicate and basally the oval profile is attenuated. Only one valve was obtained. The hinge line is not strongly crenulated, owing to the delicacy of the radial threading.

LIMOPSIS PANAMENSIS, new species.

Shell small, moderately convex, of a pale slate color, covered with a dark blackish brown pilose periostracum more or less disposed in radiating lines; beaks low, plump; hinge area narrow, with a well-marked fossette; interior of shell dull bluish white, with six posterior

and three (or four) anterior teeth bifid at their summits; basal margin of the valves and part of the anterior and posterior margins denticulate, the upper portions plain. Lon. 6.0; alt. 6.0; diam. 3.0 mm.

Dredged in Panama Bay, at station 3393, in 1,020 fathoms, mud; bottom temperature 36° 8 F. U.S.N.M., 109028.

This little shell is quite similar to *L. minuta*, but is constantly smaller, of a different color, and with the pelage much blacker and in closer-set lines; the form of the valves when compared with *L. minuta* of the same size is more quadrate, the denticulation of the inner margin less extended, and the valves are more delicate.

VENUS KENNICOTTII Dall.

Plate XL, fig. 7.

Mercenaria kennicottii DALL, Am. Journ. Conch., VII, Pt. 2, 1871, p. 147, pl. xvi, fig. 1.

Neah Bay, State of Washington (Swan), and at Little River, Mendocino County, California (Harford). U.S.N.M., 75017.

Shell of a yellowish white with some ferruginous stains externally. The original type specimen obtained from the Indians at Neah Bay and a young valve obtained by Harford are all the specimens known of this rare and interesting species. It belongs to the typical *Venus* of Lamarck (1799), which was named *Mercenaria* by Schumacher.

PANOPEA GLOBOSA Dall.

Plate XL, fig. 1.

Panopea (generosa var. ?) *globosa* DALL, Trans. Wagner Free Inst. Sci., III, June, 1898, p. 831.

Valves were collected on the beaches at the head of the Gulf of California by Dr. Edward Palmer. U.S.N.M., 74884.

The shell is of a yellowish white color, shorter, thinner, and more globose than *P. generosa* and probably distinct. It reaches 160 mm. in extreme length.

PANOMYA AMPLA Dall.

Plate XL, figs. 3, 4.

Panomya ampla DALL, Trans. Wagner Free Inst. Sci., III, June, 1898, p. 833.

Panopea norvegica MIDDENDORFF (part) Malak. Rossica, III, 1849, p. 78, pl. xx, fig. 11; not of Spengler.

Recent in the Aleutian region, Gulf of Alaska, and Okhotsk Sea in shallow water, and fossil in the Pleistocene of the same region. U.S.N.M., 151221.

The shell is chalky white with a black dehiscent tarry periostracum, which is rarely preserved even in the living animal, which the valves only partially cover.

CETOCONCHA SCAPHA, new species.

Shell small, thin, elongate, subequilateral, evenly rounded in front, arcuate below, slightly attenuated and obliquely subtruncate behind; valves moderately convex, subtranslucent white with a pale-yellow very thin periostracum, with close, very fine radial lines of almost microscopic granulations; beaks plump, but not elevated, ligament short, brown, situated in the anterior sixth of a narrow escutcheon, bounded by a low keel; anterior hinge line slightly arched with a single minute obsolete right cardinal tubercle; posterior hinge line straight, the margin subangulate at its extremity behind; ligamentary nymph inconspicuous; interior of the valves polished, pallial line simple and with the muscular impressions, hardly visible; margins entire, shell slightly gaping behind; soft parts as in *C. elongata* Dall; lon. 12.6, alt. 8.2; diam. 6.0 mm.

Dredged by the U. S. Fish Commission steamer *Albatross* in the Gulf of Panama, off Cocos Island in 100 fathoms, mud, at station 3367, bottom temperature 57°.1 F. U.S.N.M., 109026.

This species resembles most nearly *C. elongata* Dall, from 200 fathoms in the Straits of Florida, a species which is larger and proportionately higher. It is interesting as being from the most shallow water in which the genus is yet known to occur, most of the specimens having come from great depths.

BRACHIPODA.

TEREBRATALIA HEMPHILLI, new species.

Plate XL, figs. 8, 10.

Pliocene of Santa Barbara, between one-half and 1 mile inland from the sea, in Arroyo Buero on the Hope ranch; collected by J. Howard Wilson. U.S.N.M., 108495.

Shell substantially as figured, thin, rather compressed or not very convex; transverse, valves with low, flattish, ill-defined radial riblets, which, except near the beaks, become obsolete toward the middle of the valves. Mesial flexure shallow, broad mesially concave. Area narrow, ill defined; foramen narrow, high, incomplete below; punctation fine and profuse. Alt. 30.0, lat. 33.0, diam. 12.0 mm.

Owing to the condition of the shell, which is full of consolidated matrix, the interior could not be examined, but the characteristics all point toward the species being one of a group abundant on the west coast in a recent state and containing such species as *T. transversa* Sowerby and *T. obsoleta* Dall. A specimen supposed to be of the same species has been found in the Pliocene of San Pedro, but I have not had an opportunity to make a critical comparative study of the two.

CRANIA PATAGONICA, new species.

Upper valve rather depressed, white, rounded except at the posterior margin, which is subtruncate; vertex small, prominent, situated at the posterior third; surface concentrically rather slightly rugose but not lamellose; covered somewhat sparsely with numerous radiating, short, minute tubercles or spines; interior of the valve minutely, profusely, conspicuously punctate, the muscular and genital impressions feeble, the valve feebly margined; impressions of the divaricator muscles feeble; what appears to be a minute accessory impression occurs outside of each divaricator impression close to the margin; in the center, between the divaricators, is a small obscure prominence close to the margin; the impressions of the adductors in the valve studied are somewhat irregular, reniform, and small; between them but not in contact medially are the also irregular, smaller imprints of the dorsal adjusters; in front of these is an obscure trilobed impression, and in front and then still further forward are some very faint vascular markings feebly lobulate or dentate near the margin. Lon. of valve 7.5, lat. 8.5, alt. 2.0 mm.

Dredged in 122 fathoms, mud, bottom temperature 48° F., at station 2783, on the west coast of Chilian Patagonia, in the Madre de Dios Archipelago, by the U. S. Fish Commission. U.S.N.M., 130516.

The single valve which was obtained is undoubtedly new, since no spinose *Crania* has hitherto been known. It is also the first indication of *Crania* in this region, the only Antarctic species hitherto reported being *C. suessi* Reeve, the locality of which is probably Moreton Bay, Australia, although it was erroneously referred to Sydney by its describer.

In this connection the existence of a spinose *Hemithyris* in Japan may be recalled, though in that form the spinules are more intimately associated with the lamellose incremental sculpture than in the present case.

EXPLANATION OF PLATES.

PLATE XXVII.

- Fig. 1. *Nanina* (*Macrochlamys*?) *diadema* Dall, basal view; major diameter 18.0 mm.; p. 499.
2. The same, in profile.
3. The same, from above.
4. *Urtrea vaderi* Dall, basal view, the margin of the aperture slightly defective; major diameter 4.0 mm.; p. 500.
5. The same, in profile.
6. The same, from above.
7. *Punctum randolphii* Dall, from below; major diameter 1.4 mm.; p. 500.
8. The same, in profile.
9. The same, from above.
10. *Zonitoides* (*Pseudohyalina*) *pugetensis* Dall, from below; major diameter 1.5 mm.; p. 500.

- Fig. 11. *Ashmunella rhyssa* Dall, profile; diameter 16.0 mm.; p. 500.
 12. *Zonitoides (Pseudohyalina) pugetensis* Dall, from above; major diameter 1.5 mm.; p. 500.
 13. *Ashmunella pseudodonta* Dall, from below; diameter 14.0 mm.; p. 500.
 14. *Ashmunella rhyssa* Dall, from below; diameter 16.0 mm.; p. 500.
 15. *Ashmunella pseudodonta* Dall, from above; diameter 14.0 mm.; p. 500.

PLATE XXVIII.

- Fig. 1. *Ceres nelsoni* Dall, from above; diameter 27.0 mm.; p. 501.
 2. *Holospira (Haplostemma) hamiltoni* Dall, profile of the basal whorls; p. 501.
 3. *Ceres nelsoni* Dall, basal view; diameter 27.0 mm.; p. 501.
 4. *Ashmunella ashmuni* Dall, basal view; diameter 14.0 mm.; p. 501.
 5. Portion of surface of *Ceres nelsoni*, enlarged to show granular sculpture.
 6. *Ashmunella ashmuni* Dall, from above; diameter 14.0 mm.; p. 501.
 7. *Ashmunella pseudodonta* Dall, profile; diameter 14.0 mm.; p. 500.
 8. *Ceres nelsoni* Dall, profile; diameter 27.0 mm.; p. 501.
 9. *Ashmunella ashmuni* Dall, profile; diameter 14.0 mm.; p. 501.
 10. *Siphonaria lineolata* Orbigny, basal view; longitude 24.0 mm.; p. 501.
 11. *Holospira (Haplostemma) hamiltoni* Dall, profile; altitude 19.0 mm.; p. 501.
 12. *Siphonaria alternata* Say, basal view; longitude 24.5 mm.; p. 501.
 13. *Siphonaria lineolata* Orbigny, profile; longitude 24.0 mm.; p. 501.
 14. *Siphonaria alternata* Say, profile; longitude 24.5 mm.; p. 501.

PLATE XXIX.

- Fig. 1. *Cylichna verrillii* Dall; altitude 7.5 mm.; p. 502.
 2. *Retusa mayoi* Dall; altitude 8.3 mm.; p. 502.
 3. *Daphnella eugrammata* Dall; altitude 9.0 mm.; p. 503.
 4. *Admete microscopica* Dall; altitude 4.3 mm.; p. 504.
 5. *Muricidea philippiana* Dall; altitude 17.4 mm.; p. 504.
 6. *Terebra rushii* Dall; altitude 15.0 mm.; p. 503.
 7. *Conus stimpsoni* Dall; altitude 37.0 mm.; p. 503.
 8. *Terebra texana* Dall; altitude 137.0 mm.; p. 502.
 9. *Terebra floridana* Dall; altitude 70.0 mm.; p. 503.
 10. *Scala scipio* Dall; altitude 16.0 mm.; p. 506.
 11. *Aurinia dubia* Broderip; altitude 69.0 mm.; p. 504.

PLATE XXX.

- Fig. 1. *Muricidea (Pseudoneptunea) multangula* Philippi; altitude 31.0 mm.; p. 505.
 2. *Muricidea ostrearum* Conrad; altitude 28.0 mm.; p. 505.
 3. *Scala (Amæa) mitchelli* Dall; altitude 36.0 mm.; p. 506.
 4. The same, basal view; diameter 14.0 mm.; p. 506.
 5. *Umbraclum (Hyalopatina) rushii* Dall; longitude 9.3 mm.; p. 502.
 6. *Latirus cayohuesonicus* Sowerby and Melvill; altitude 16.0 mm.; p. 505.
 7. *Scala (Cirsotrema) cochlea* Sowerby; altitude 20.0 mm.; p. 506.
 8. *Scala nitidella* Dall; altitude 13.5 mm.; p. 505.
 9. *Scala (Acrilla) retifera* Dall; altitude 12.5 mm.; p. 506.

PLATE XXXI.

- Fig. 1. *Arca adamsi* Smith, var. *conradiana* Dall; longitude 7.0 mm.; p. 508.
 2. *Arca (Cucullaria) sagrinata* Dall; longitude 6.0 mm.; p. 508.
 3. *Pandora (Kernerleyia) bushiana* Dall; longitude 10.0 mm.; p. 511.
 4. *Pandora (Clidiophora) trilineata* Say; longitude 19.0 mm.; p. 511.
 5. *Meretrix (Transennella) conradina* Dall; longitude 13.5 mm.; p. 509.

- Fig. 6. *Maetra richmondi* Dall; longitude 20.75 mm.; p. 510.
 7. *Meretrix* (*Transennella*) *conradina* Dall, part of a left valve greatly magnified to show the oblique grooving of the margin; p. 509.
 8. *Chama lactuca* Dall, attached valve from above; longitude 22.0 mm.; p. 509.
 9. *Asthenothærus hemphilli* Dall; longitude 6.25 mm.; p. 510.
 10. *Chama lactuca* Dall, free valve, from above; longitude 14.0 mm.; p. 509.
 11. *Crenella pectinula* Gould, from cotype; longitude 16.0 mm.; p. 507.
 12. *Crenella faba* Müller; longitude 18.0 mm.; p. 508.

PLATE XXXII.

- Fig. 1. *Meretrix* (*Agriopoma*) *texasiana* Dall; longitude 67.0 mm.; p. 509.
 2. *Lima albicoma* Dall; longitude 8.0 mm.; p. 507.
 3. *Meretrix simpsoni* Dall; longitude 15.2 mm.; p. 510.
 4. *Philobrya atlantica* Dall, dorsal view showing nepionic umbones; longitude 4.0 mm.; p. 507.
 5. The same, side view; longitude 4.0 mm.
 6. *Astarte globula* Dall; longitude 8.5 mm.; p. 508.
 7. *Pandora* (*Clidiophora*) *gouldiana* Dall; longitude 27.5 mm.; p. 511.
 8. *Mactrella iheringi* Dall; longitude 65.0 mm.; p. 510.
 9. *Pecten* (*Plagioctenium*) *gibbus* var. *amplicostatus* Dall; latitude 51.0 mm.; p. 507.

PLATE XXXIII.

- Figs. 1-3. *Argonauta expansa* Dall, three views; longitude 94.0 mm.; p. 511.

PLATE XXXIV.

- Fig. 1. *Tritonofusus* (*Plicifusus*) *brunneus* Dall; altitude 19.0 mm.; p. 525.
 2. *Tritonofusus* (*Plicifusus*) *rectirostris* Carpenter; altitude 32.0 mm.; p. 525.
 3. *Fusus*? (*Roperia*) *roperi* Dall, from type; altitude 26.0 mm.; p. 517.
 4. *Pleurotoma* (*Antiplanes*) *vinosa* Dall; altitude 33.0 mm.; p. 514.
 5. *Astyris aurantiaca* Dall; altitude 5.0 mm.; p. 531.
 6. *Tritonofusus martensi* Krause; altitude 40.0 mm.; p. 526.
 7. *Murex* (*Pteropurpura*) *petri* Dall; altitude 50.0 mm.; p. 532.
 8. *Pleurotoma* (*Antiplanes*) *perversa* Gabb; altitude 44.0 mm.; p. 513.
 9. *Murex* (*Pteropurpura*) *carpenteri* Dall; altitude 38.0 mm.; p. 532.

PLATE XXXV.

- Fig. 1. *Beringius crebricostatus* Dall; altitude 124.0 mm.; p. 530.
 2. *Volutopsius* (*beringi* Middendorff var.?) *kobelti* Dall; altitude 96.0 mm.; p. 528.
 3. *Beringius*? *kennicottii* Dall; altitude 130.0 mm.; p. 530.
 4. *Scaphella stearnsii* Dall; altitude 146.0 mm.; p. 517.

PLATE XXXVI.

- Fig. 1. *Pleurotoma circinata* Dall; altitude 80.0 mm.; p. 515.
 2. *Volutopsius castaneus* Mörch; altitude 79.0 mm.; p. 529.
 3. *Volutopsius attenuatus* Dall; altitude 58.0 mm.; p. 529.
 4. *Tritonofusus* (*Plicifusus*) *roseus* Dall; altitude 23.0 mm.; p. 526.
 5. *Chrysodomus tabulatus* Baird; altitude 92.0 mm.; p. 524.
 6. *Volutopsius regularis* Dall; altitude 63.0 mm.; p. 529.
 7. *Tritonofusus* (*Plicifusus*) *spitzbergensis* Reeve; altitude 57.0 mm.; p. 526.
 8. *Tritonofusus* (*Plicifusus*) *virens* Dall; altitude 15.5 mm.; p. 525.
 9. *Tritonofusus hallii* Dall, from type; altitude 42.0 mm.; p. 525.
 10. *Tritonofusus* (*Plicifusus*) *herendeenii* Dall; altitude 70.0 mm.; p. 527.

PLATE XXXVII.

- Fig. 1. *Buccinum angulosum* Gray, female; feebly carinated and ribbed; altitude 58.0 mm.; p. 517.
2. *Buccinum angulosum* Gray, male; variety *subcostatum* Dall; ecarinate sparsely ribbed form; altitude 45.0 mm.; p. 518.
3. *Buccinum angulosum* Gray, female; typical form on which the species was founded, strongly carinated and sharply ribbed; altitude 48.0 mm.; p. 518.
4. *Buccinum percassum* Dall; altitude 34.0 mm.; p. 518.
5. *Buccinum plectrum* Stimpson, female; altitude 40.0 mm.; p. 519.
6. *Buccinum angulosum* Gray, var. *normale* Dall, male; normal form without ribs or carina; altitude 40.0 mm.; p. 518.
7. *Buccinum castaneum* Dall, female; normal and typical form; altitude 63.0 mm.; p. 519.
8. *Buccinum picturatum* Dall, female; from type; the coloration is not indicated; altitude 55.0 mm.; p. 520.
9. *Buccinum* (*castaneum* Dall, variety) *tricarinatum* Dall, female; altitude 58.0 mm.; p. 519.

PLATE XXXVIII.

- Fig. 1. *Submarginula yatesi* Dall, from above; longitude 51.0 mm.; p. 555.
2. *Liomesus canaliculatus* Dall; altitude 35.5 mm.; p. 531.
3. *Submarginula yatesi* Dall, view of the interior.
4. *Anaplocamus borealis* Dall; altitude 17.0 mm.; p. 550.
5. *Pedicularia californica* Newcomb; altitude 10.0 mm.; p. 550.
6. *Cancellaria middendorffiana* Dall; altitude 17.5 mm.; p. 516.
7. *Liomesus nux* Dall, from type; altitude 31.0 mm.; p. 530.
8. *Zeidora flabellum* Dall; longitude 12.5 mm.; p. 555.
9. *Amauropsis purpurea* Dall; altitude 35.0 mm.; p. 551.

PLATE XXXIX.

- Fig. 1. *Calliostoma turbinum* Dall; altitude 12.0 mm.; p. 552.
2. *Gibbula canfieldi* Dall; altitude 10.0 mm.; p. 553.
3. *Calliostoma iridium* Dall; altitude 20.0 mm.; p. 552.
4. *Litorina aleutica* Dall, from above; altitude 12.0 mm.; p. 551.
5. *Drillia empyrosia* Dall, from type; altitude 31.0 mm.; p. 516.
6. *Litorina aleutica* Dall, profile; altitude 11.0 mm.; p. 551.
7. *Margarites vorticiferus* Dall, basal view; altitude 16.0 mm.; p. 554.
8. The same in profile; altitude 11.5 mm.
9. *Buccinum tenellum* Dall, from type; altitude 22.25 mm.; p. 519.
10. *Calliostoma variegatum* Carpenter, adult; altitude 25.0 mm.; p. 552.
11. *Litorina atkana* Dall, banded variety; altitude 20.0 mm.; p. 551.

PLATE XL.

- Fig. 1. *Panopea* (*generosa* variety?) *globosa* Dall; longitude 160.0 mm.; p. 560.
2. *Pecten* (*Pseudamusium*) *randolphi* Dall; altitude 27.0 mm.; p. 559.
3. *Panomya ampla* Dall, exterior; altitude 83.0 mm.; p. 560.
4. The same, interior view.
5. *Pecten* (*Pseudamusium*) *davidsoni* Dall; altitude 14.7 mm.; p. 559.
6. The same, view of left valve.
7. *Venus kennicottii* Dall, type; longitude 66.0 mm.; p. 560.
8. *Terebratalia hemphilli* Dall, from the Pliocene of Santa Barbara, hæmal view; width 35.0 mm.; p. 561.
9. *Leda hamata* Carpenter; longitude 9.0 mm.; p. 558.
10. *Terebratalia hemphilli* Dall, ventral view; width 35.0 mm.; p. 561.

INDEX TO GENERA.

[Names in italics are newly proposed.]

- Acrilla*, 506.
Actæon, 512.
Actinotrophon, 534, 541.
Acus, 503.
Admete, 504.
Agriopoma, 509.
Amæa, 506.
Amauropsis, 551.
Anaplocamus, 550.
Ancistrolepis, 523.
Antiplanes, 513.
Antistreptus, 532.
Arca, 508.
Argonauta, 511.
Ashmunella, 500.
Astarte, 508.
Asthenothærus, 510.
Astyris, 531.
Atractus, 520.
Aurinia, 504.
Austrotrophon, 534, 548.

Beringius, 524, 529.
Boreofusus, 524.
Boreotrophon, 533, 537, 543.
Buccinopsis, 530.
Buccinum, 517.

Calliostoma, 552.
Cancellaria, 516.
Ceres, 501.
Cetoconcha, 561.
Chalmon, 535.
Chama, 509.
Chiton, 555.
Chrysodomus, 520, 522, 525.
Cirsotrema, 506.
Clidiophora, 511.
Conus, 503.
Crania, 562.
Crenella, 507, 559.
Ctenoides, 507.
Cucullaria, 508.
Cylichna, 502.

Daphnella, 503.
Drillia, 516.

Ecphora, 522.
Emarginula, 555.

Fossularca, 508.

Fusus, 517.

Ganessa, 554.
Gibbula, 553.

Haplostemma, 501.
Heliotropis, 522.
Hemithyris, 562.
Holospira, 501.
Hyalopatina, 502.

Ischnochiton, 557.

Jumala, 529.

Kennerleyia, 511.

Latirus, 505.
Leda, 558.
Lepidopleurus, 555.
Lima, 507.
Limopsis, 559.
Liomesus, 524, 530.
Lissogyra, 554.
Litorina, 551.

Mactra, 510.
Mactrella, 510.
Margarita, 554.
Margarites, 554.
Maugerella, 558.
Mercenaria, 560.
Meretrix, 509, 510.
Microglyphis, 512.
Mipus, 535.
Mohnia, 523.
Murex, 532.
Muricea, 504.

Nanina, 499.
Neptunea, 520, 536.
Neptunella, 520.

Pagodula, 534, 539.
Pandora, 511.
Panomya, 560.
Panopea, 560.
Pecten, 507, 559.
Pedicularia, 550.
Philobrya, 507.
Pinon, 535.
Pirgos, 535, 542.

Plagiectenium, 507.
Pleurotoma, 513, 515.
Pseudamuseum, 559.
Pseudoneptunea, 505.
Pseudohyalina, 500.
Pteronotus, 532.
Pteropurpura, 532.
Pteryumurex, 532.
Punctum, 500.

Retusa, 502.
Rhombus, 520.
Roperia, 517.

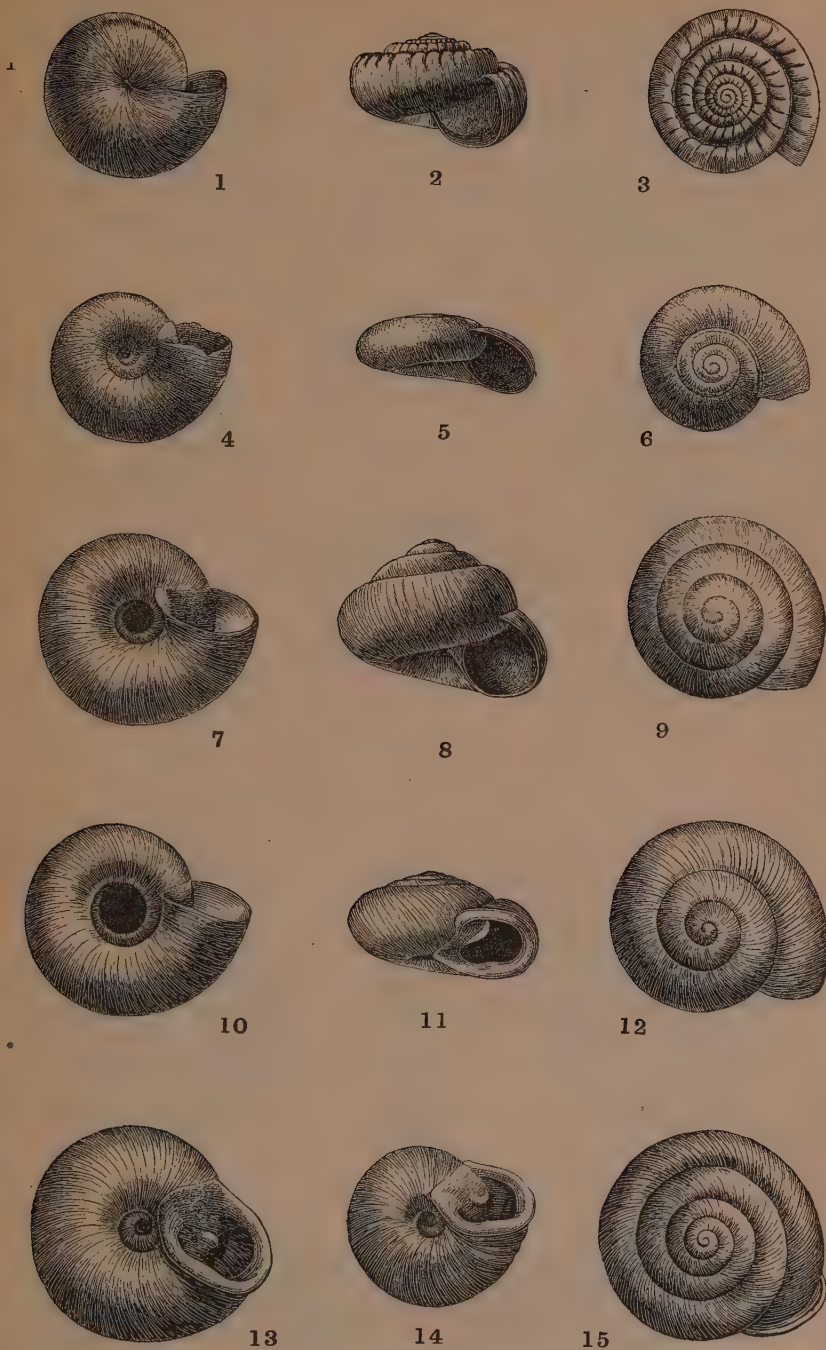
Scala, 505.
Scaphella, 517.
Sipho, 520.
Siphonaria, 501.
Siphonella, 520.
Siphonorbis, 520, 522.
Solariella, 553.
Stenoradsia, 558.
Strombella, 521.
Submarginula, 555.
Subula, 503.
Sulcosinus, 524.

Terebra, 502.
Terebratalia, 561.
Toledonia, 512.
Trachyradsia, 558.
Transennella, 509.
Tritonellium, 520.
Tritonofusus, 520, 522, 525.
Trophon, 533, 535, 548.
Trophonopsis, 533, 538, 541, 546.
Troschelia, 524.
Typhis, 550.

Ukko, 529.
Umbraculum, 502.

Venus, 560.
Vitrea, 500.
Voluta, 517.
Volutopsis, 521, 523.
Volutopsius, 521, 523, 527.

Zeidora, 555.
Zonitoides, 500.



PULMONATA, CHIEFLY NORTH AMERICAN.

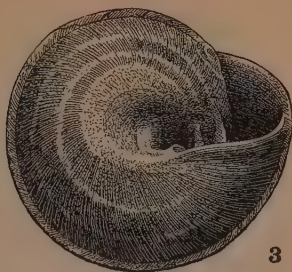
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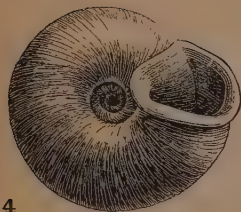
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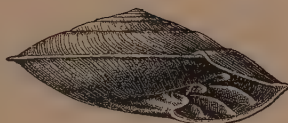
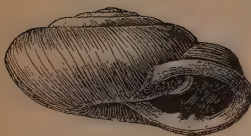
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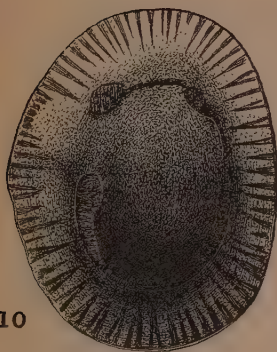
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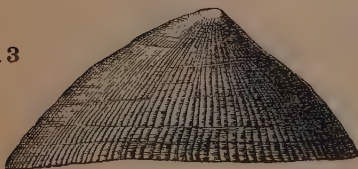
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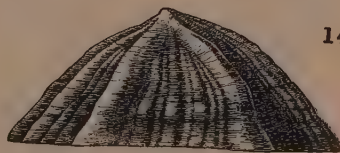
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12



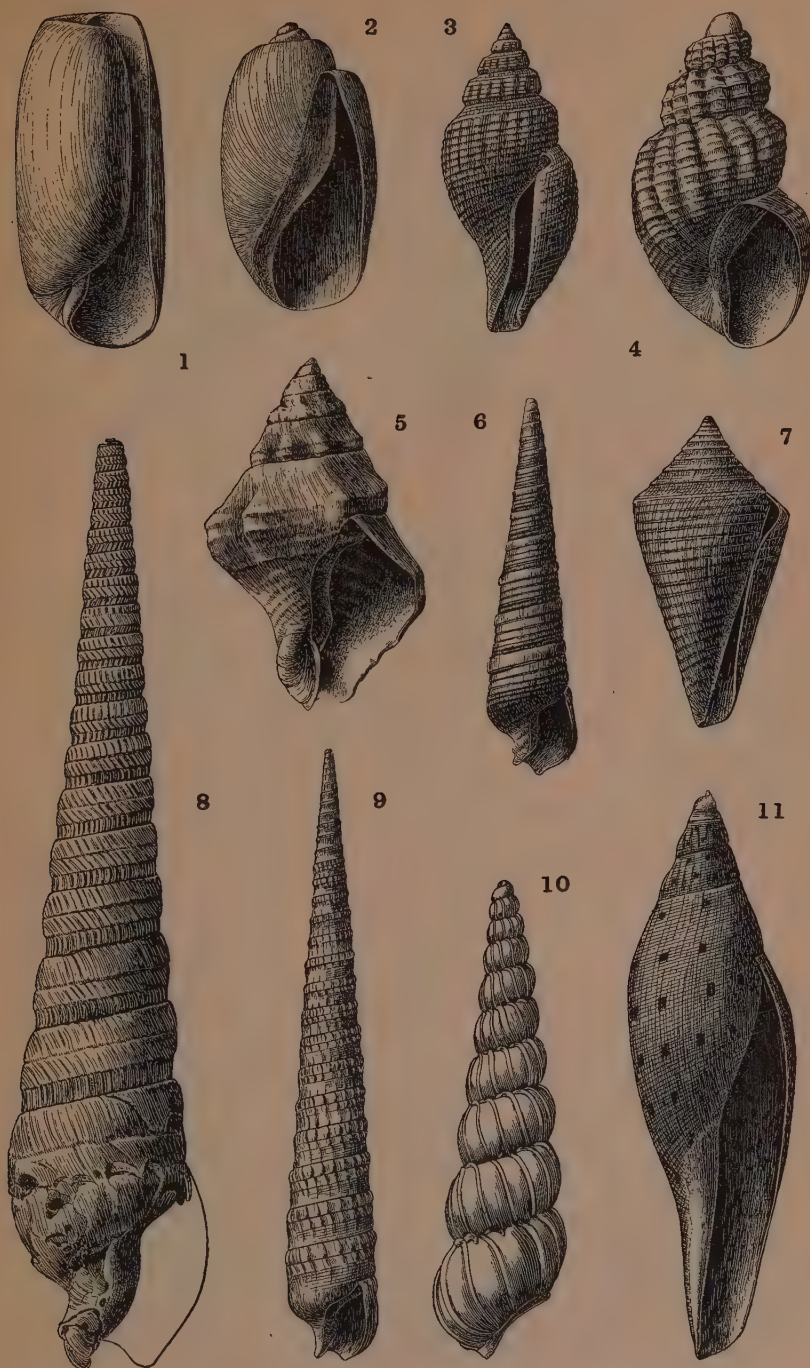
13



14

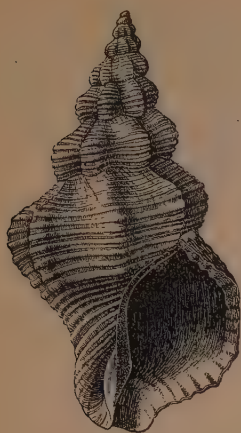
AMERICAN PULMONATA.

FOR EXPLANATION OF PLATE SEE PAGE 563.



EAST AMERICAN GASTROPODS.

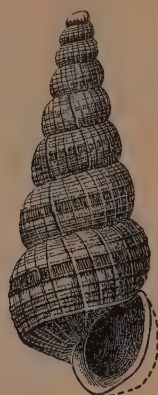
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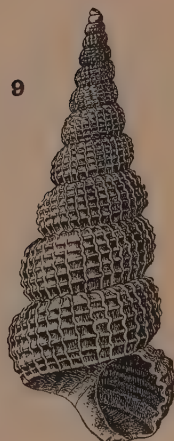
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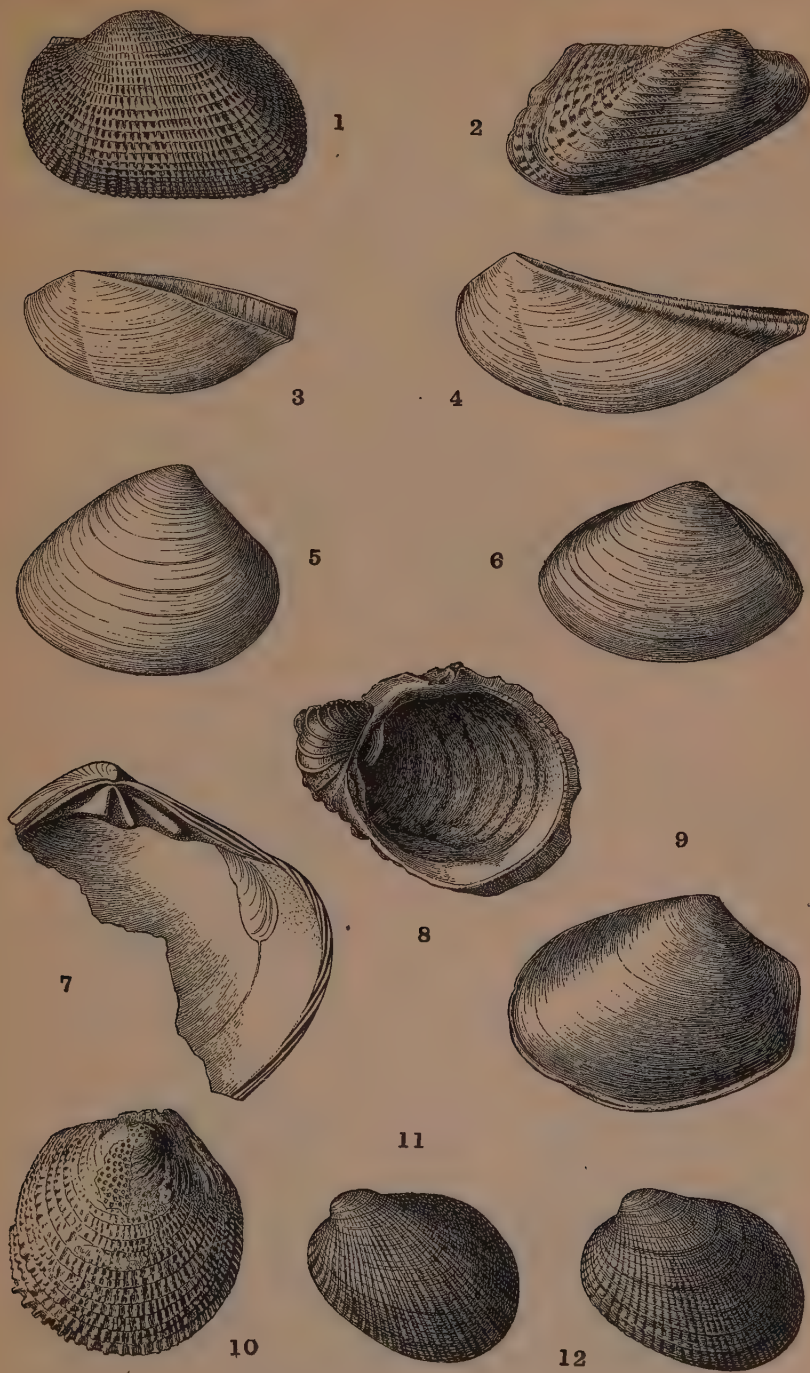
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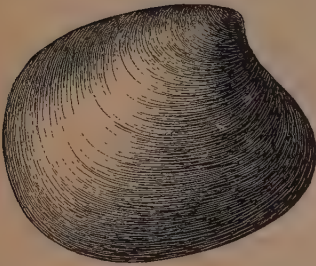
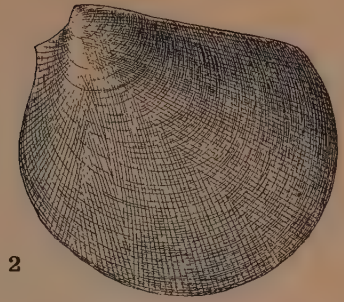
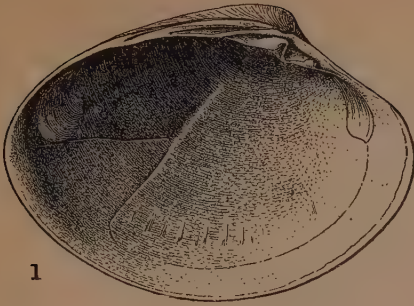
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EAST AMERICAN GASTROPODS.

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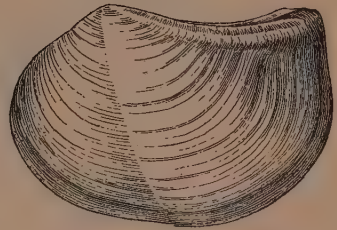


EAST AMERICAN PELECYPODS.
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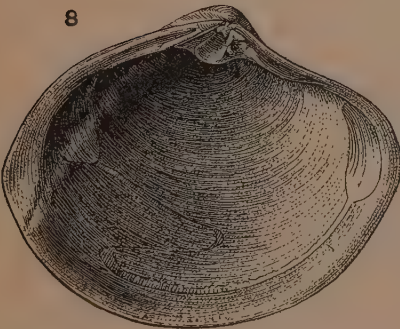


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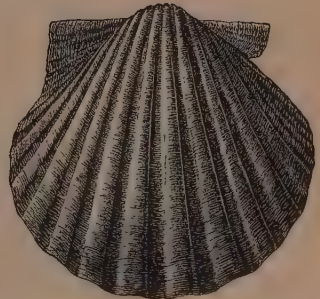
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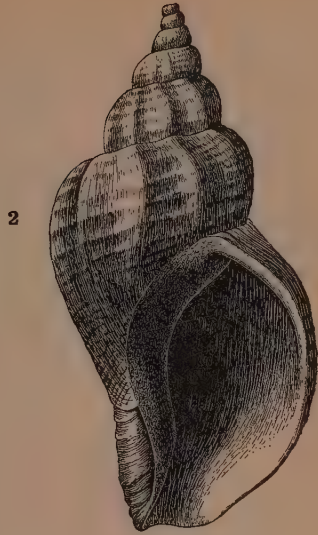
EAST AMERICAN PELECYPODS.

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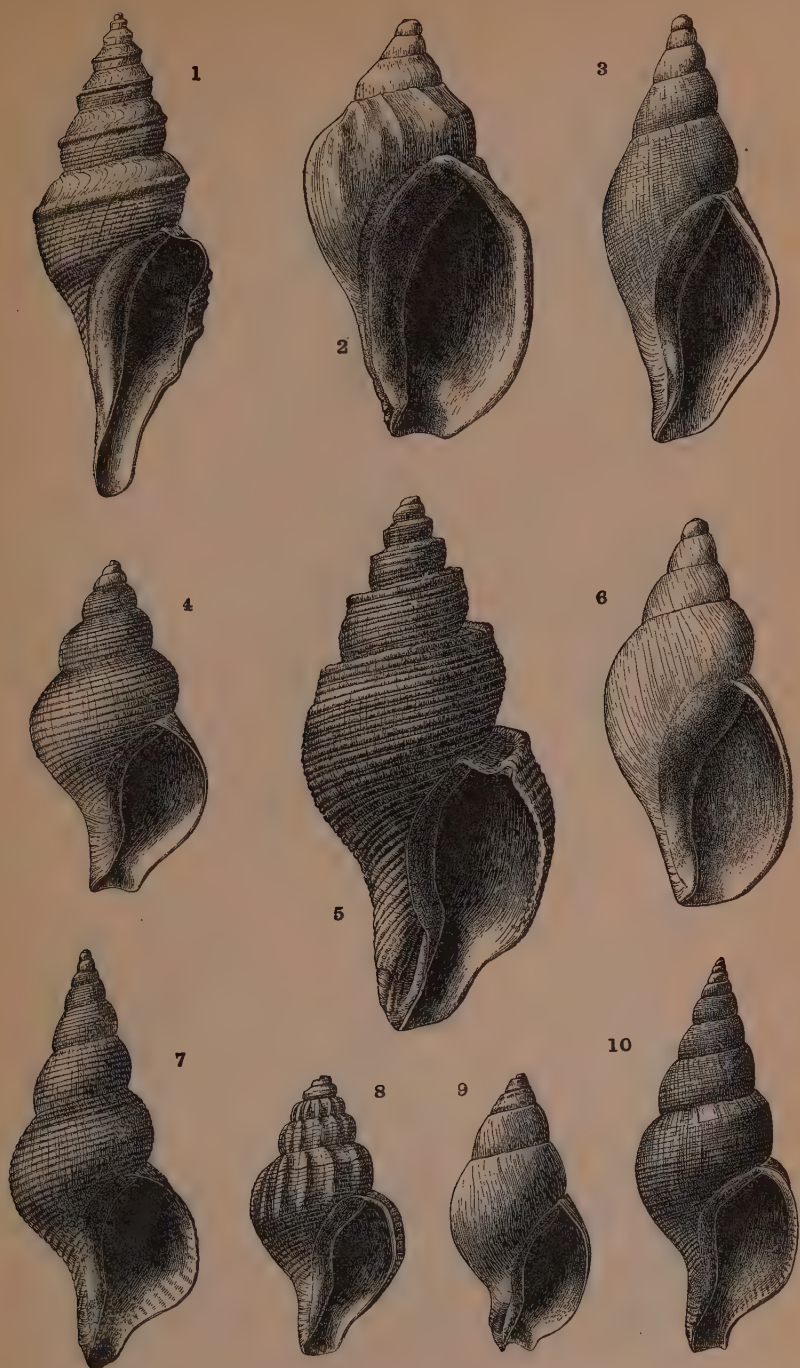
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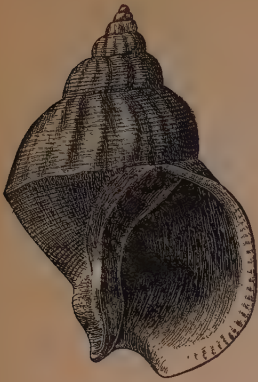
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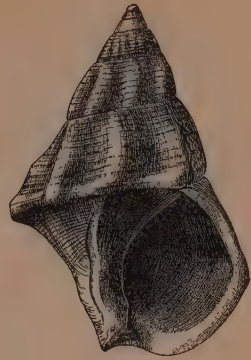
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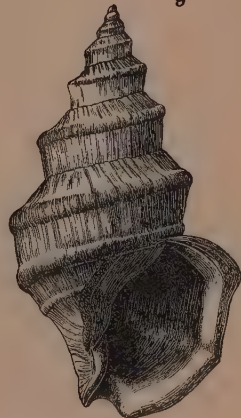
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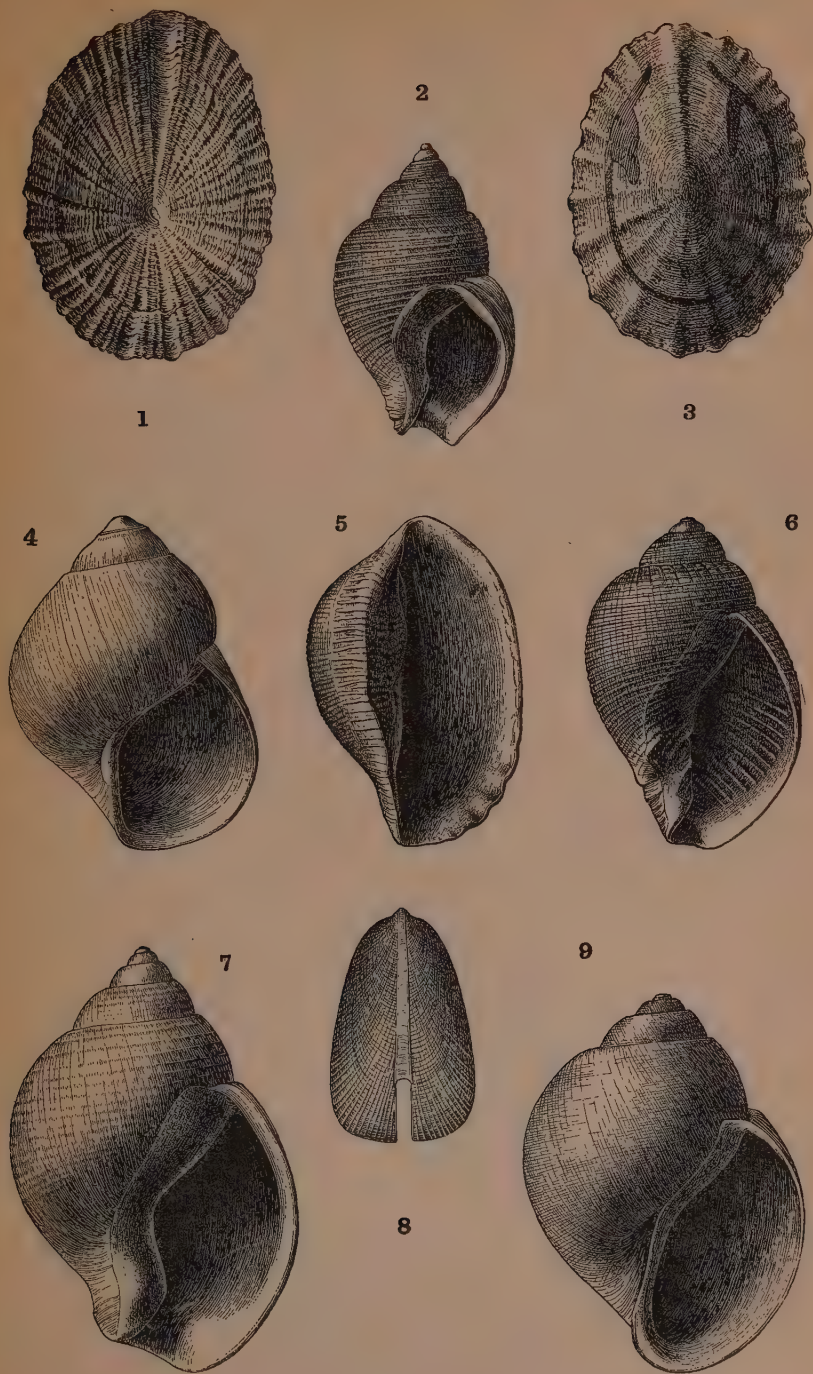
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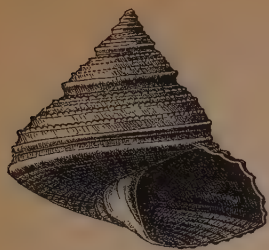
ALASKAN BUCCINUM.

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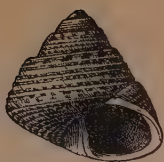


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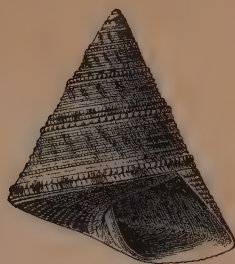
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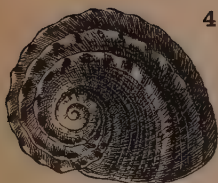
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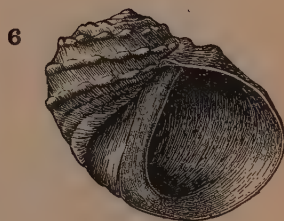
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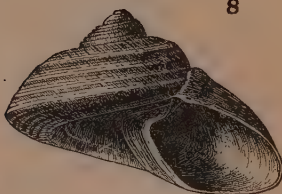
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10



11

WEST AMERICAN GASTROPODS.

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WEST AMERICAN PELECYPODS.

FOR EXPLANATION OF PLATE SEE PAGE 565.

A REVIEW OF THE SALMONOID FISHES OF JAPAN.

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In the present paper is given a descriptive catalogue of the Salmonidæ, Argentinidæ, and Salangidæ known to inhabit the waters of Japan. It is based on material obtained by the writers in 1900, series of the specimens being in the museum of Leland Stanford Junior University and in the United States National Museum.

Family I. SALMONIDÆ.

SALMON FAMILY.

Body oblong or elongate, covered with cycloid scales. Head naked. Mouth terminal, large or small, varying much in the different genera; maxillary forming the lateral margin of the upper jaw, provided with a supplemental bone; premaxillaries not protractile. Teeth various, sometimes wanting. Gills 4, a slit behind the fourth. Pseudobranchiæ present. Gill rakers various; gill membranes not connected, free from the isthmus; branchiostegals 10 to 20. No barbels. Dorsal usually nearly median, not greatly elongate, its rays 9 to 15, only one or two of the anterior simple or rudimentary, the others branched; adipose fin present; caudal fin forked; anal fin moderate or rather long; ventrals moderate, nearly median; pectorals placed low. Lateral line present. Abdomen rounded in outline. Parietals not in contact, separated at middle by the intervention of the supraoccipital, which connects with the frontals; epipleural appendages not developed. Air bladder large, stomach siphonal; pyloric cæca very numerous. Ova large, falling into the cavity of the abdomen before exclusion. As now restricted, this is no longer one of the large families of fishes, but in beauty, activity, gameness, and quality as food, and even in size of individuals, different members of the group stand easily with the first among fishes. The Salmonidæ are confined to the northern regions, and north of about 40° N., everywhere abundant where suitable waters occur. Some of the species, especially the larger ones, are

marine and anadromous, living and growing in the sea, and entering fresh waters to spawn. Still others live in running brooks, entering lakes or the sea as the occasion serves, but not habitually doing so. Others again are lake fishes, approaching the shore, or entering brooks in the spawning season, at other times retiring to waters of considerable depth. Some of them are active, voracious, and gamy, while others are comparatively defenseless and will not take the hook. The large size of the eggs and their lack of adhesiveness, with the ease by which the eggs may be impregnated, render the Salmon and Trout especially adapted for artificial culture. The Salmonidæ are of comparatively recent evolution, few of them occurring as fossils, except in the most recent deposits. The instability of the specific forms and the lack of sharply defined specific characters may be in part attributed to their recent origin, as Dr. Günther has suggested.

- a. Mouth deeply cleft, the long lower jaw articulating with the quadrate bone behind the eye, the maxillaries rather narrow.
- b. *Salmoninæ*. Dentition strong and complete; conical teeth on jaws, vomer, and palatines; tongue with two series of strong teeth (sometimes deciduous in very old specimens); scales small.
- c. Anal fin elongate, of 14 to 17 developed rays; gill rakers 20 to 40; branchiostegals 12 to 16; vomer narrow, long, flat, with weak teeth; species spotted with black, if at all. *Oncorhynchus*, 1.
- cc. Anal fin shorter, of 9 to 13 developed rays; gill rakers 10 to 15; branchiostegals 10 to 14.
- d. Vomer flat, its toothed surface plane; teeth on the shaft of the vomer in alternating rows or in one zigzag row, those on the shaft placed directly on the surface of the bone, not on a free crest; posterior vomerine teeth sometimes deciduous; species black spotted *Salmo*, 2.
- dd. Vomer boat-shaped, the shaft strongly depressed, without teeth; hyoid bone with very weak teeth or none; species not anadromous.
- e. Scales moderate, silvery; body covered with small, black spots; head flattened above, the jaws long. *Hucho*, 3.
- ee. Scales small (about 200); body with round, red, whitish or yellowish spots; head not depressed *Salvelinus*, 4.
- aa. *Plecoglossinæ*. Dentition feeble; premaxillaries with a few pointed teeth; teeth of maxillaries and of lower jaw broad, truncated, serrate lamellæ, movable, each in a fold of skin; inside of mouth behind lower jaw with folds of skin; tongue with minute teeth; vomer with few or none; scales very small.

Plecoglossus, 5.

1. ONCORHYNCHUS Suckley.

QUINNAT SALMON.

Oncorhynchus SUCKLEY, Ann. Lyc. Nat. Hist. N. Y., 1861, p. 312 (*scouleri*).

Hypsifario GILL, Proc. Ac. Nat. Sci. Phila., 1862, p. 330 (*kennerlyi*).

Body elongate, subfusiform, or compressed. Mouth wide, the maxillary long, lanceolate, usually extending beyond the eye; jaws with moderate teeth, which become in the adult male enormously enlarged in front. Vomer long and narrow, flat, with a series of teeth both on the head and the shaft, the latter series comparatively short and weak;

palatines with a series of teeth; tongue with a marginal series on each side; teeth on vomer and tongue often lost with age; no teeth on the hyoid bone. Branchiostegals more or less increased in number. Scales moderate or small. Dorsal fin moderate; anal fin comparatively elongate, of 14 to 20 rays. Pyloric appendages in increased number. Gill rakers rather numerous. Ova large. Sexual peculiarities very strongly developed; the snout in the adult males in summer and fall greatly distorted; the premaxillaries prolonged, hooking over the lower jaw, which in turn is greatly elongate and somewhat hooked at tip; the teeth on these bones also greatly enlarged. The body becomes deep and compressed; a fleshy hump is developed before the dorsal fin, and the scales of the back become embedded in the flesh; the flesh, which is red and rich in spring, becomes dry and poor. Salmon, mostly of large size, ascending the rivers tributary to the North Pacific in North America and Asia, spawning in the autumn. The genus is very close to *Salmo*, differing only in the increased number of certain organs. The species never feed in the rivers and die after spawning. (*ὄγκος*, hook; *ρύγχος*, snout.)

- a. *Oncorhynchus*. Gill rakers comparatively short and few (20 to 30 in number).
 b. Scales very small, more than 160 (160 to 210) in a longitudinal series above the lateral line.
 c. Caudal fin large, with oblong black spots; branchiostegals 11 or 12; anal rays 15 (*gorbuscha*.¹)

¹ONCORHYNCHUS GORBUSCHA (Walbaum).

HUMPBACK SALMON OF ALASKA.

Salmo gorbuscha WALBAUM, *Artedi Piscium*, 1792, p. 69; Kamchatka, after the *Gorbuscha* of Pennant and Krascheninnikow.

Oncorhynchus gorbuscha JORDAN and GILBERT, *Synopsis*, 1883, p. 305.—JORDAN and EVERMANN *Fishes N. and M. Amer.*, I, 1896, p. 478.

Salmo gibber BLOCH and SCHNEIDER, *Syst. Ichth.*, 1801, p. 409; Kamchatka, after Krascheninnikow.

Salmo proteus PALLAS, *Zoogr. Russo-Asiatica*, III, 1811, p. 376; Bering Sea.—SUCKLEY *Monogr. Salmo*, 1861 (1874), p. 97.

Oncorhynchus scouleri GÜNTHER, *Cat.*, VI, 1866, p. 158.

Salmo scouleri RICHARDSON, *Fauna Bor.-Amer.*, III, 1836, p. 158; Observatory Inlet.

Oncorhynchus proteus GÜNTHER, *Cat.*, VI, 1866, p. 157.

Salmo tscharvytschiformis SMITT, *I Riksmuseum Befintlige Salmonider*, 1886, p. 161; Port Clarence.

B. 11 or 12. Gill rakers 13+15. A. (developed rays) 15; D. 11; scales 215 (210–240), those of the lateral line larger, 170. Pyloric cæca very slender, about 180. Body rather slender, in the female plump and symmetrical, in the autumn males very thin and compressed, with the fleshy dorsal hump much developed and the jaws much elongated, strongly hooked, and with extravagant canines in front. Ventral appendage half the length of the fin. Color bluish; sides silvery; back posteriorly, adipose fin, and tail with numerous black spots; those on the caudal fin particularly large and oblong in form; autumn males red, more or less blotched with brownish; weight 3 to 6 pounds; Pacific coast and rivers of North America and Asia from Oregon northward, and southward to Kamtchatka, not yet known from Japan; occasionally taken in the Sacramento. Known at once by the very small size of the scales, and by the coarse oblong spots on the tail. The flesh is much inferior to that of *tscharvytscha* and *nerka*.

(*gorbuscha*, the Russian vernacular name in Alaska.)

- cc. Caudal fin small; unspotted; branchiostegals 14 or 15; anal rays about 14 *masou*, 1.
- bb. Scales medium, about 145 (138 to 155) in a longitudinal series; pyloric cæca about 150.
- d. Anal rays 13 or 14; black spots small or obsolete; branchiostegals 13 or 14; caudal broad; body mottled blackish and silvery *keta*, 2.
- dd. Anal rays about 16; back and upper fins with round black spots; B. 15 to 19 (*tschawytscha*¹)
- bbb. Scales comparatively large, about 130 (125 to 135) in a longitudinal series; pyloric cæca 50 to 80; tip of dorsal black; black spots few *kisutch*, 3
- aa. *Hypsifario*: Gill rakers comparatively long and numerous (33 to 40 in number); scales large, about 130; back in adults unspotted, clear blue in spring, red in fall; young more or less spotted in front of dorsal; landlocked examples small and more closely spotted *nerka*, 4

ONCORHYNCHUS TSCHAWTSCHA (Walbaum).

QUINNAT SALMON; TCHAVICHE; KING SALMON OR CHINNOOK SALMON.

Salmo tschawytscha WALBAUM, *Artedi Piscium*, 1792, p. 71: rivers of Kamchatka; after the *Tschawytscha* of Krascheninnikow, *Desc. Kamchatka*, 1768, p. 178, and the *Tschawytscha* of Pennant, 1792.—BLOCH and SCHNEIDER, *Syst. Ichth.*, 1801, p. 407.

Oncorhynchus tschawytscha JORDAN and EVERMANN, *Fishes N. and M. Amer.*, I, 1896, p. 479.

Salmo orientalis PALLAS, *Zoogr. Ross.-Asiat.*, III, 1811, p. 367; Kamchatka.

Oncorhynchus orientalis GÜNTHER, *Cat.*, VI, 1866, p. 159.

Salmo quinnat RICHARDSON, *Fauna Bor.-Amer.*, III, 1836, p. 219; Columbia River, and of many writers.

Salmo argyreus SUCKLEY, *Pacific R. R. Surv.*, XII, 1860, Pt. 2, p. 326, and *Monogr. Salmo*, 1861 (1874), p. 110.

Fario argyreus GIRARD, *Proc. Ac. Nat. Sci. Phila.*, 1856, p. 218; Cape Flattery, Fort Steilacoom.

Oncorhynchus quinnat GÜNTHER, *Cat.*, VI, 1866, p. 158.—JORDAN, *Proc. U. S. Nat. Mus.*, 1878, p. 69.

Salmo confluentus SUCKLEY, *Ann. Lyc. Nat. Hist. N. Y.*, December, 1858, and *Pacific R. R. Surv.*, XII, 1860, Pt. 2, p. 334; Puyallup River, near Fort Steilacoom (Coll. Suckley); and *Monogr. Salmo*, 1861 (1874), p. 109.

Oncorhynchus chowicha JORDAN and GILBERT, *Synopsis*, 1893, p. 306.

Head 4; depth 4. B. 15 or 16 to 18 or 19, the number on the two sides always unlike. D. 11; A. 16. Gill rakers usually 9 + 14 (i. e., 9 above the angle and 14 below). Pyloric cæca 140 to 185; scales usually 27-146-29; the number in a longitudinal series varying from 140 to 155, and in California specimens occasionally as low as 135. Vertebrae 66. Head conic, rather pointed in the females and spring males. Maxillary rather slender, the small eye behind its middle. Teeth small, longer on sides of lower jaw than in front; vomerine teeth very few and weak, disappearing in the males. In the males in late summer and fall the jaws become elongated and distorted, and the anterior teeth much enlarged, as in the related species. The body then becomes deeper, more compressed, and arched at the shoulders, and the color often nearly black. Preopercle and opercle strongly convex. Body comparatively robust, its depths greatest in its middle. Ventrals inserted behind middle of dorsal, ventral appendage half the length of the fin; caudal, as usual in this genus, strongly forked, on a rather slender caudal peduncle. Color dusky above, often tinged with olivaceous or bluish; sides and below silvery; head dark slaty, usually darker than the body and little spotted; back, dorsal fin, and tail usually profusely covered with round black spots (these are sometimes few, but very rarely altogether wanting); sides of head and caudal fin with a peculiar metallic tin-colored luster; male, about the spawning season (October), blackish, more or less tinged or blotched with dull red. Flesh red and rich in spring, becoming paler in the fall as the spawning season approaches. Length 2 to 5 feet. Usual weight in the Columbia River 22 pounds, in the Sacramento 16 to 18 pounds; in smaller rivers still less, but individuals of 70 to 100 pounds have been taken. Alaska, Oregon, and California, southward to Ventura River, and to northern China, ascending all

I. ONCORHYNCHUS MASOU (Brevoort).

MASU; YEZOMASU.

Salmo masou BREVOORT, Exped. Japan, 1856, p. 275, pl. ix, fig. 2; Hakodate; (description from a very bad drawing;

Oncorhynchus yessoensis HILGENDORF, Monatsber. Ges. Ostasien, XI, 1876, p. 25; Hokkaido.

Head 4 in length; depth 4; depth of caudal peduncle $3\frac{1}{2}$ in head; snout $4\frac{2}{3}$; eye 7; maxillary $2\frac{1}{2}$; D. 13; A. 15; scales in lateral series about 190; between lateral line and insertion of dorsal about 29.

Interorbital space convex, $3\frac{1}{4}$ in length of head; maxillary extending considerably beyond eye; gill rakers 12+17 on first arch, long and slender; branchiostegals 13. Teeth on jaws weak, a few very small ones on palatines and vomer. Opercle and preopercle strongly convex behind; caudal fin forked, strong and short, contained about 5 times in the length; pectoral $1\frac{2}{3}$ in head; ventral $2\frac{1}{2}$; the ventral appendage almost two-thirds the length of fin.

Coloration rather dark; sides silvery; no distinct black spots on body or fins; tip of dorsal and inside of pectorals and ventrals blackish. Here described from an immature female specimen in alcohol, 360 millimeters long, from Aomori. The accompanying figure is taken from this specimen.

This species resembles the Humpback salmon of Alaska and British Columbia (*Oncorhynchus gorbuscha* Walbaum). It seems to differ, however, in the larger scales (about 190) and the larger number of branchiostegals, 13 to 16 instead of 11 or 12 as in *O. gorbuscha*. The caudal fin lacks the large oblong black spots seen in *O. gorbuscha*. The species also resembles *O. keta*, but can be usually distinguished by the smaller size, smaller scales, darker fins, and narrower caudal. The tip of the dorsal and the inside of the pectorals and ventrals are very

large streams; especially abundant in the Columbia and Sacramento rivers, where it is the principal salmon. The usual order of salmon running in the streams of Oregon and Washington is *nerka*, *tshawytscha*, *kisutch*, *gorbuscha*, and *keta*. Those which start first go farthest. This species ascends the large streams in spring and summer, moving up, without feeding, until the spawning season, by which time many of those which started first may have traveled more than 1,000 miles. It ascends the Snake River to the neighborhood of Upper Salmon Falls, where it spawns in October and November. In the Salmon River of Idaho it ascends to the headwaters, more than 1,000 miles from the sea, where it spawns in August and early September when the water has reached a temperature of about 54° F. After spawning, most or all of those which have reached the upper waters perish from exhaustion. It is by far the most valuable of the species of salmon. It has lately been introduced into streams of eastern North America, and should be introduced into the streams of Japan, where as yet it is unknown.

(*tshawytscha*, better spelled by earlier writers *Tchaviche*, the vernacular name in Alaska and Kamchatka.)

dark. A third specimen, obtained in salt at Aomori, came from the Ishikari River at Sapporo in Hokkaido. We have also young examples said to have been taken in the Daiya River at Nikko. The species is thus far known only from the island of Hokkaido, from the neighboring shores of the province of Aomori, and from the Daiya River.

The Japanese fishermen fail to distinguish the smaller salmon (*masu*, *kisutch*) from the adult of the Japanese trout (*Salmo perryi*), calling them all alike *Masu*, in opposition to the large salmon *O. keta*,



FIG. 1.—ONCORHYNCHUS MASOU.

called *Sake*, and the young trout, which are called Yamabe. This confusion extends to some of the published writings. The different species are, however, correctly distinguished by Hilgendorf. In his account of *O. yessoensis* Hilgendorf, however, counts 133 to 137 scales in the lateral line. This leaves some doubt as to the specimen he had in hand. He finds also 16 dorsal rays, doubtless including the rudiments.

(*masu* the Japanese name of small salmon; *yeso* is the old name of the great island now called Hokkaido, or "North Shore.")

2. ONCORHYNCHUS KETA (Walbaum).

SAKE; DOG SALMON; CALICO SALMON.

Salmo keta vel *kayko* WALBAUM, Artdi Piscium, 1792, p. 72; Rivers of Kamchatka; after the *Keta* or *Kayko* of Pennant and Krascheninnikow.

Oncorhynchus keta JORDAN and GILBERT, Synopsis, 1883, p. 305.

Salmo lagocephalus PALLAS, Zoogr. Ross.-Asiatica, III, 1811, p. 372; Bering Sea.

Oncorhynchus lagocephalus GÜNTHER, Cat., VI, 1866, p. 161.

Salmo japonensis PALLAS, Zoogr. Ross.-Asiatica, III, 1811, p. 382; Kurile Islands; Amur River.

Salmo dermatinus RICHARDSON, Voyage Herald, Zoöl., 1854, p. 167; Yukon River.

Salmo consuetus RICHARDSON, Voyage Herald, Zoöl., 1854, p. 168; Yukon River.

Salmo canis SUCKLEY, Ann. Lyc. Nat. Hist. N. Y., 1858, p. 9; and Monogr. Salmo, 1861, p. 101 (1874); Puget Sound.—JORDAN and EVERMANN, Fish. N. and M. Amer., I, 1896, p. 478; San Francisco; Kamchatka; Bering Straits.

Oncorhynchus haberi HILGENDORF, Monatsber., Ges. Ost-Asien, XI, 1876, p. 25; Hokkaido.—ISHIKAWA, Prel. Cat., 1897, p. 20; Nishibetsu R., Yechigo, Matsushiro, Shinshin.

Head 4; depth 4; D. 9; A. 13 or 14; scales about 28-150-30; B. 13 or 14, rather broad; gill rakers 9+15; pyloric cæca 140-185. General

form of *O. tshawytscha*, but the head proportionately longer, more depressed and pike-like; the preopercle more broadly convex behind, and the maxillary extending considerably beyond eye; gill rakers few, coarse, and stout as in the Quinnet; accessory pectoral scale short, not half the length of fin; caudal fin broad. Dusky above; sides paler, little lustrous; back and sides with no defined spots, but only fine specklings, which are often entirely obsolete; head dusky, scarcely any metallic luster on head or tail; caudal dusky, plain, or very finely maculate, its edge usually distinctly blackish; fins all mostly blackish, especially in males; breeding males generally blackish above, with sides brick red, often barred or mottled. Weight 8 to 12 pounds. Hokkaido to Kamchatka, and south to northern California, ascending all streams in the autumn, and spawning at no great distance from the sea. At the time of its run the males of this species are much distorted and the flesh has little value. It is the common large salmon of northern Japan swarming in its rivers in the fall. It is known to all fishermen

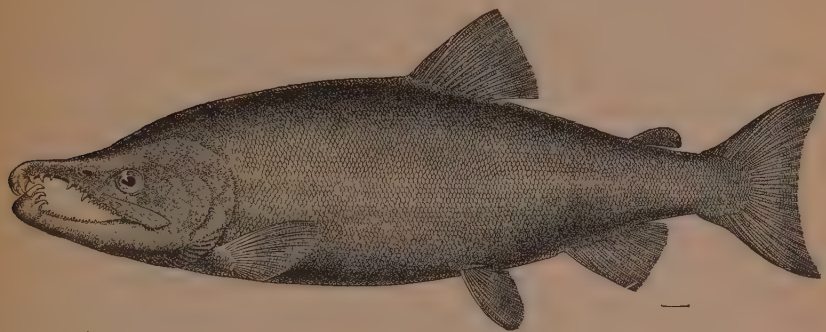


FIG. 2.—ONCORHYNCHUS KETA.

as *Sake*. It ranges southward to Same and Noto, and the annual value of the product is given by Matsubara at \$400,000. Salted salmon is valued as a New Year's present in Japanese homes.

This description is from specimens from Puget Sound. The figure is taken from an old male from Hakodate, much distorted and entirely black. The extreme lankness of this individual is not well shown in the figure. Our specimens are from Ishikari River, Hokkaido, in the markets of Aomori and Hakodate. One of these weighing 9 pounds showed the following characters: Scales 160; B. 14 to 16; anal fin high, with concave edge, less falcate than in *O. masou*; its rays III, 14; (II, 15; III, 13 in other specimens); first anal ray 2 in head; head $4\frac{1}{2}$ in length; depth 4. Coloration dirty silvery, blotched with darker, no black spots; pectorals, ventrals, and dorsals blackish, the paired fins darker on the inner edge, the dorsals on its anterior half. Old males are still darker, almost black, and extravagantly distorted. The flesh in this species is pale and pasty, unfit for canning purposes, and

in all respects less valuable than in any of the other species of *Oncorhynchus*. The introduction of better species to the Japanese rivers is a matter of great economic importance.

(*Keta*, a vernacular name in Kamchatka.)

3. ONCORHYNCHUS KISUTCH (Walbaum.)

GINMASU, SILVER SALMON, KISUTCH.

? *Salmo milktschitch* WALBAUM, Artedi Piscium, 1792, p. 70; Bering Sea; after *Milktschutch* or *Milktschitsch* of Pennant and Krascheninnikow; probably the young of *kisutch*.

Salmo kisutch WALBAUM, Artedi Piscium, 1792, p. 70; rivers and lakes of Kamchatka; after the *Kisutch* of Pennant.

? *Salmo striatus* BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 407; Kamchatka; after *Milktschitsch* of Krascheninnikow.

Salmo kysutch BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 407; Kamchatka; after Pennant.

Salmo sanguinolentus PALLAS, Zoogr. Ross.-Asiat., III, 1811, p. 379; Bering Sea.

Salmo tsuppitch RICHARDSON, Fauna Bor.-Amer., III, 1836, p. 224; Columbia River.—GÜNTHER, Cat., VI, 1866, p. 118.

Oncorhynchus lycaodon GÜNTHER, Cat., VI, 1866, p. 155; in part.

Salmo scouleri SUCKLEY, Monogr. Salmo, 1861 (1874), p. 94.

Oncorhynchus sanguinolentus GÜNTHER, Cat., VI, 1866, p. 160.

Oncorhynchus tsuppitch JORDAN, Forest and Stream, Sept. 16, 1880, p. 130.

Oncorhynchus kisutch JORDAN and GILBERT, Synopsis. 1883, p. 307.—JORDAN and EVERMANN, Fish N. and M. Amer., 1896, p. 480.

Oncorhynchus perryi HILGENDORF, Monatsb. Ges. Ostasien, 1876, p. 25 (not *Salmo perryi* Brevoort).—ISHIKAWA, Prel. Cat., 1897, p. 20; Arikawa, Toshima, Hakodate, Matsushiro, Shinshin.

Head 4; depth 4; B. 13 or 14; pyloric cæca very few and large, 63 (45 to 80); gill rakers 10 + 13, rather long and slender, nearly as long as eye, toothed; scales 25–127–29; D. 10; A. 13 or 14 (developed rays). Body rather elongate, compressed. Head short, exactly conical, terminating in a bluntly pointed snout, which is longer and broader than the lower jaw; head shorter than in a young quinnat (*tschawytscha*) of the same size. Interorbital space broad and strongly convex; opercle and preopercle strongly convex behind; the preopercle very broad, with the lower limb little developed; cheeks broad. Eye quite small, much smaller than in young quinnat of the same size. Suborbital very narrow, with a row of mucous pores along its surface; maxillary slender and narrow, but extending somewhat beyond the eye. Teeth very few and small, only 2 or 3 on the vomer; those on tongue very feeble; fins small; pectorals and ventrals short, the ventral appendage three-fifths the length of the fin; caudal strongly forked, on a slender peduncle. Bluish green, sides silvery, with dark punctulations; dorsal always tipped with black; this color usually conspicuous both in the adult and the young; no spots, except a few rather obscure on top of head, back, dorsal fin, adipose fin, and the rudimentary upper rays of the caudal; rest of the caudal fin unspotted; pectorals dusky

tinged; anal with dusky edging; sides of head without the dark coloration seen in the quinnat; males mostly red in autumn, and with the usual changes of form. Length 15 inches; weight 3 to 8 pounds. A small salmon, ascending streams in the autumn to no great distance. Abundant from San Francisco northward, especially in Puget Sound and the Alaskan fjords; south on the Asiatic coasts to Japan. Here described from Puget Sound specimens. A specimen from Otaru in the museum at Hakodate seems to be typical of the species, the tip of the dorsal black, as usual. Three others from the Otaru, two from Ura River, and several from Osatsubo, sent by the museum at Sapporo, seem to be the young of this species. Four adult examples (325, 331, 332, 337) were secured by us in the market at Aomori.

(*Kisutch*, the vernacular name in Alaska and Kamchatka; called by the Russians *Bielaya Ryba*, or whitefish).

4. ONCORHYNCHUS NERKA (Walbaum).

BENIMASU (RED SALMON), BLUE BACK.

Salmo nerka WALBAUM, Artedi Piscium, 1792, p. 71; after the *Nerka* of Pennant, the *Narka* of Kraschininnikow, rivers and seas of Kamchatka.—BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 417; after Pennant and Kraschininnikow.

Salmo lycaodon PALLAS, Zoogr. Rosso-Asiat., III, 1811, p. 370; Ochotsk Sea, Kamchatka.

Salmo paucidens RICHARDSON, Fauna Bor.-Amer., III, 1836, p. 222; Columbia River.

Salmo tapdisma CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXI, 1848, p. 365; Kamchatka; on a drawing.

Salmo arabatsch CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXI, 1848, p. 365; Kamchatka; on a drawing.

Salmo melampterus CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXI, 1848, p. 365; Kamchatka; on a drawing.

Salmo kennerlyi SUCKLEY, Ann. Lyc. Nat. Hist. N. Y., VII, 1861, p. 307; Chilo-weyuck Lake (dwarf and landlocked); (Type, No. 2092. Coll. Kennerly).—SUCKLEY, Monogr. Salmo, 1861 (1874), p. 145.—GÜNTHER, Cat., VI, 1866, p. 120.

Salmo cooperi SUCKLEY, Notices New Species N. A. Salmon, New York, June, 1861, and Monogr. Salmo, 1861 (1874), p. 99; Okanogan River. (Coll. Geo. Gibbs.)

Salmo warreni SUCKLEY, Notices New Species N. A. Salmon, June, 1861, and Monogr. Salmo, 1861 (1874), p. 147; Fraser River, British Columbia. (Type, Nos. 2070 and 2073. Coll. Kennerly.)

Salmo richardi SUCKLEY, Notices New Species N. A. Salmon, June, 1861, and Monogr. Salmo, 1861 (1874), p. 117; Fraser and Skagit rivers. (Type, No. 2005.)

Hypsifario kennerlyi GILL, Proc. Ac. Nat. Sci. Phila., 1862, p. 330.

Oncorhynchus lycaodon GÜNTHER, Cat., VII, 1866, p. 155.

Oncorhynchus paucidens GÜNTHER, Cat., VII, 1866, p. 158.

Oncorhynchus nerka JORDAN and GILBERT, Synopsis, 1883, p. 308.—JORDAN and EVERMANN, Fish N. and M. Amer., I, 1896, p. 481.

Oncorhynchus nerka kennerlyi BEAN, Forest and Stream, July 9, 1891.

Head 4; depth 4. B. 13 to 15; D. 11; A. 14 to 16; scales 20–133–20; pyloric cæca 75 to 95; vertebræ 64. Gill rakers about 32 to 40, usually

14 or 15 + 22 or 23, as long as eye. Body elliptical, rather slender. Head short, sharply conic, pointed, the lower jaw included. Maxillary rather thin and small, extending beyond eye. Teeth all quite small, most of them freely movable; vomer with about 6 weak teeth, which grow larger in fall males, instead of disappearing. Preopercle very wide and convex; opercle very short, not strongly convex. Preopercle largely free behind. Ventral scale about half the length of the fin. Caudal fin narrow, widely forked; anal fin long and low; dorsal low. Flesh deep red. Males becoming extravagantly hook-jawed in the fall, the snout being then prolonged and much raised above the level of rest of head, the lower jaw produced to meet it; mandible $1\frac{1}{2}$ in head in fall males, $1\frac{3}{4}$ in females; snout $2\frac{1}{4}$ in head in fall males, $3\frac{1}{2}$ in females. Color clear bright blue above; sides silvery, this hue overlying the blue of the back; lower fins pale, upper dusky; no spots anywhere in adults in spring; the young with obscure black spots above.

Color of breeding male, back blood red, with dark edges to some of the scales; middle of side darker red, but unevenly so, usually darkest at middle of body; under parts dirty white, with numerous fine dark dustings; head above and on sides pale olivaceous, some darker mottling on sides; tip of nose and side of jaws dark, under part of lower jaw white; dorsal pale red, anal darker red; adipose fin red; ventrals and pectorals smoky, some red at base. Color of breeding female essentially the same, rather darker on the sides. Length 2 feet; weight $3\frac{1}{2}$ to 8 pounds. (Description from Columbia River specimens.)

Two specimens, measuring about 270 millimeters, from Lake Akan in Hokkaido, show the following characters:

Head 4 in length; depth $4\frac{1}{2}$; depth of caudal peduncle $2\frac{2}{3}$ in head, eye $4\frac{2}{3}$; snout $4\frac{1}{2}$; maxillary 2; interorbital space $3\frac{1}{4}$; scales in lateral series 130; in transverse series 19 + 22; D. 11; A. 15. Teeth on jaws small, immovable; those on palatines and vomer equal in size to those of jaws; interorbital space convex; preopercles and opercles decidedly convex posteriorly; branchiostegals 14, gill rakers on first arch long and slender 13 + 20. Caudal very broad, not deeply forked; ventral appendage short, contained about $2\frac{1}{2}$ times in length of fin. Fins all dark, the pectorals and ventrals darker above than below; upper parts of body, caudal fin and base of dorsal with round or oblong dark brown spots.

Another specimen has but one or two indistinct spots on base of dorsal and on upper part of caudal; the caudal fin is more forked.

The species ranges from Hokkaido to Kamchatka, Alaska, and southward to Oregon. It is abundant in Alaska, ascending streams in spring to great distances, and often frequenting mountain lakes in fall, spawning in their small tributaries. It is one of the most graceful of the Salmonidæ, scarcely inferior to the quinnat when fresh, but

the flesh more watery and less valuable when canned. It is the principal salmon of Alaska, and one which merits introduction into the lakes of Japan. This species is very rare in Japan. In the museum at Hakodate is a third specimen from Akan Lake in the Province of Kushiro, in northern Hokkaido. This specimen, about a foot long, is blue above, with a few faint dark spots, silvery below. D. 11, 10; A. 11, 14; scales 135; gill rakers $15+22=37$; B. 13. A specimen without spots in the same museum, labeled *Benimasu* or *Red Salmon*, also apparently belongs to this species. It is from Urup Island (Kuriles). The two described above from Lake Akan, a little larger and darker in color have been received from Professor Nozawa of the museum at Sapporo. It is said that the species occurs in no other locality in Japan proper except about Kushiro Bay, into which Akan Lake flows, and that it never reaches a larger size. Similar dwarfish varieties, known as subsp. *kennerlyi*, occur in lakes of Idaho and Washington.

2. SALMO¹ (Artedi) Linnæus.

Salmo (Artedi, Genera Piscium) LINNÆUS, Syst. Nat., 10th ed., 1758, p. 308, (*salar*, etc.).

Trutta LINNÆUS, Syst. Nat., 10th ed., 1758, p. 308 (*trutta*, etc.: "*Trutta corpore variegato*").

Fario CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXI, 1848, p. 277 (*argenteus* = *trutta*).

Salar CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXI, 1848, p. 314 (*ausonii* = *fario*).

Trutta SIEBOLD, Süßwasserfische Mittel Europa, 1863, p. 280 (*trutta*).

Body elongate, somewhat compressed. Mouth large; jaws, palatines, and tongue toothed, as in related genera; vomer flat, its shaft not depressed, a few teeth on the chevron of the vomer, behind which is a somewhat irregular single or double series of teeth, which in the migratory forms are usually deciduous with age. Scales large or small, 110 to 200 in a longitudinal series. Dorsal and anal fins short,

¹SALMO FARIO Linnæus.

ANEMASU (FOREIGN TROUT); EUROPEAN BROOK TROUT.

Salmo fario LINNÆUS, Syst. Nat., 12th ed., I, p. 509, and of authors generally.

This European species has been introduced into Japan. A specimen taken in Lake Chuzenji seems to belong to this species. It is said to have been introduced from America. Length 14 inches; head $4\frac{1}{2}$; depth $4\frac{1}{2}$; D. II, 11; A. I, 13; B. 13; snout $3\frac{3}{4}$; eye $4\frac{1}{2}$; P. $1\frac{3}{4}$ in head; maxillary 2. Scales 120 in lateral line, not counting small ones at base of caudal; 130 oblique series. Anal low, short, white, its margin concave, its longest ray $2\frac{3}{4}$ in head, $1\frac{1}{2}$ in base of fin. Color olive above, sides very silvery; no dark specks or edgings to the scales; dorsal, caudal, and pectoral slightly dusky; anal all white; no parr marks, upper parts with scattered round black spots; spots on dorsal, adipose, and base of caudal. Caudal well forked, the middle caudal ray from scales $3\frac{1}{2}$ in the longest ray. Nine pairs vomerine teeth, weak in a shorter row. The species is said to reach a length of 3 feet. It is slenderer and paler than the Japanese trout, with the tail more deeply forked and the parr marks obsolete.

usually of 10 to 12 rays each; caudal fin truncate, emarginate or forked, its peduncle comparatively stout. Branchiostegals 11 to 13; gill rakers about 20. Sexual peculiarities variously developed; the males in typical species with the jaws prolonged and the front teeth enlarged, the lower jaw being hooked upward at the end and the upper jaw emarginate or perforate. In the larger or migratory species these peculiarities are most marked. Species of moderate or large size, black-spotted, abounding in the rivers and lakes of North America, Asia, and Europe; no fresh-water species occurring in America east of the Mississippi Valley; a few species, marine and anadromous. The nonmigratory species are in both continents extremely closely related and difficult to distinguish. The excessive variations in color and form have given rise to a host of nominal species. Those which ascend the rivers from the sea feed in the streams, and it is probable that not all die after spawning.

(*salmo*, the Latin name of *Salmo salar*, originally from *salire*, to leap).

5. SALMO PERRYI Brevoort.

KAWA-MASU (RIVER SALMON) (ADULT); YAMABE (MOUNTAIN SIDE); YAMAME (MOUNTAIN THING); YAMABAI (MOUNTAIN MINNOW).

Salmo perryi BREVOORT, Exped. Japan, 1856, p. 273, pl. ix, fig. 1; Hakodate.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 349; Lake Biwa (Karasaki).

Salmo macrostoma GÜNTHER, Shore Fishes, Challenger, 1880, p. 71, pl. xxxi, fig. A; Yokohama.—ISHIKAWA, Prel. Cat., 1897, p. 21; Tokadzu, Kushiro, Chichibu, Ojio River, Kai, Ise, Tosa.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1890, p. 743; Lake Chuzeiji.

Head $4\frac{1}{2}$ in length; depth $3\frac{3}{8}$; D. III, 12; A. I, 14; eye-5 in head; snout $3\frac{1}{2}$; B. 14; P. $1\frac{3}{4}$ in head; scales 140 (oblique rows). Anal rather low, straight edged, the longest ray $2\frac{1}{2}$ in head, $1\frac{1}{2}$ in base of fin; caudal moderately forked, the longest ray $2\frac{1}{3}$ times length of middle one measured from scales.

Body rather deep with firm scales, the black spots much the same, small, round, sparse, confined to the back, some on dorsal, adipose, and base of caudal; 3 to 5 distinct roundish dark spots along base of dorsal always present; none distinct on head; otherwise just as plain anteriorly as posteriorly; sides with 9 large parr marks or blackish bars under the scales; below these, numerous round dark spots of the same nature, each scale above with an edging of dark spots, making the fish dusky; 6 pairs of teeth forming a short line on vomer.

This description from a specimen 14 inches long from Lake Chuzeiji, having been introduced there from the River Kinu, near Utsonomiya, below the impassable fall of Kegon-no-taki. A smaller specimen taken at the same place, about $7\frac{1}{2}$ inches long, shows the following characters: D. III, 11; A. I, 12; B. 14; scales about 130.

Longest ray of anal longer than base, $2\frac{1}{2}$ in head; the fin straight-edged, high and short. Vomerine teeth in a longish row. Color as above; parr marks 9; sides reddish; pectorals yellowish; ventrals blackish, with a little white at tip; anal blackish, with whitish tip; caudal dusky, flushed with red, scales dark-edged; dorsal spotted at base; caudal unspotted.

This black-spotted trout is common in clear waters throughout the islands of Hondo and Hokkaido. As ordinarily seen in the streams it is less than a pound in weight, with the parr marks or dark cross bars distinct. These brook trout are known as Yamabe or Yamomi. In the large rivers, as the Kitakami, they reach a weight of 8 or 10 pounds. The parr marks are lost and the coloration is more silvery. In the waters of Hokkaido they descend to the sea. In the small fish the teeth on the shaft of the vomer are about 12 in number in a long double series. As the fish grows larger, the vomerine teeth are lost, until in the adult only about 4 teeth are present. These large fishes are called "Masu" or salmon by the fishermen. The dark spots vary much with individuals, but apparently not with age, some being profusely spotted, others taken at the same time almost immaculate. Both extremes in this regard are shown in our specimens from Lake Biwa, one of which is as profusely spotted as is shown in Brevoort's figure of *Salmo perryi*. Most specimens agree in this, as in other respects, with Günther's figure of *S. macrostoma*. The black blotches along base of dorsal, 3 to 5 in number, are almost always present and are diagnostic.

Of the Yamabe, or young trout, we have specimens from Aomori, Niigata, Lake Chuzenji, Kinu River at Utsonomiya, Daiya River at Nikko, Otani River near Nikko, Kamihana in Omi, Maebara on Lake Biwa, Karasaki on Lake Biwa, and Kawagiri in southwestern Rikuchu, on a tributary of the Kitakami.

Of the adult trout, Kawamasu, we have specimens from the Kitakami River at Morioka, from Aomori and Hakodate, and from the Tokyo market. The largest specimens from Hakodate reach a weight of about 12 pounds, and much resemble the salmon of the Atlantic.

From *Salmo mykiss*, of Kamchatka, which the species resembles, it is distinguished by the longer anal (12 or 13 developed rays) and by the posterior insertion of the ventrals, which are rather behind the middle of the dorsal and reach more than halfway to the vent. *Salmo mykiss* shows no trace of the distinctive spots at base of dorsal.

The species is almost intermediate between the typical group of *Salmo* and the group called *Oncorhynchus*. It indicates the transition from the former to the latter, and might with almost as much propriety be called a salmon as a trout.

From our field notes at Morioka I take the following:

Kitakami River at Morioka; a large, very plump trout with few spots; large scales; very high falcate anal of 12 rays; small head; no

red on sides or under throat; the lower fins yellowish in spawning female. Abundant in the Kitakami at this season, also sent in from Aomori. It has no teeth on the shaft of the vomer, or almost none, as in *Salmo salar*. Its flesh is firm and red, as in the Atlantic salmon, and the flavor is the same.

One small spawning female taken at Morioka. Spent males seen in Hakodate; two taken are blackish, very thin, with a red bar on side interrupted by black bars.

(Named for Commodore Perry.)

3. HUCHO Günther.

Hucho GÜNTHER, Cat. Fish., VI, 1866, p. 125 (*hucho*).

Body slender, elongate, the head pike-like, with vertical sides, and flattened snout and frontal region; mouth large; vomer as in *Salvelinus*, the shaft depressed below the head and without teeth; palatine teeth strong; strong teeth on the tongue, none on the hyoid region; scales silvery, large or small, the body marked with small black dots; anal fin short; branchiostegals 12; gill rakers few.

Old World fishes, large pike-like trout, intermediate between the charrs and the salmon.

(*hucho*, an old name of *Hucho hucho*, from the German *Huch* or *Huchen*.)

6. HUCHO BLACKISTONI (Hilgendorf).

ITO-UWO (STRING-FISH.)

Salmo blackistoni HILGENDORF, Monatsber, Gesellschaft Ostasien, 1876, p. 25; Hokkaido.—ISHIKAWA, Prel. Cat., 1897, p. 21; Hokkaido.

Head $3\frac{1}{2}$ in length; depth 5; depth of caudal peduncle $3\frac{1}{4}$ in head; eye 5; interorbital space $4\frac{1}{2}$; snout 4; maxillary $2\frac{1}{2}$; D. 10; A. 9; scales in lateral series 109, in transverse series $18 + 17$; pores in lateral line

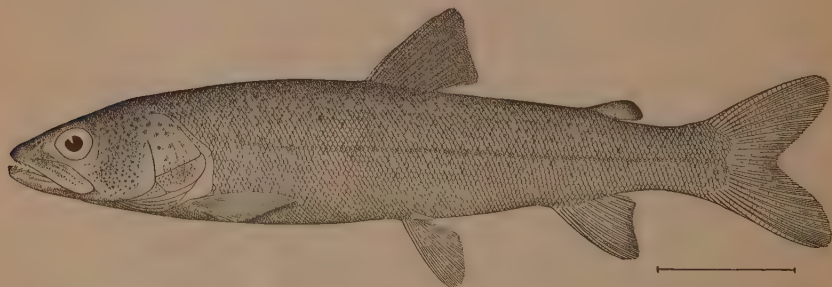


FIG. 3.—HUCHO BLACKISTONI.

97. Head long, low, broad, pike-like, quadrangular in section; interorbital area broad, slightly convex; maxillary extending a little beyond eye. Teeth small, those on lower jaw longest; no teeth on shaft of vomer, even in the young; tongue with a row of sharp teeth on each

edge; branchiostegals 12; gill-rakers on first arch $6 + 11$, long and slender. Height of dorsal $1\frac{9}{10}$ in head, anal $2\frac{1}{10}$, caudal deeply forked, $1\frac{1}{2}$ in head, ventral appendage about one-third as long as the fin, pectoral 2 in head.

Color silvery, dark above, the head and body usually profusely covered with small, brownish spots; dorsal fin with a few at its base.

Streams of northern Japan, rather common in Hokkaido, reaching a length of $2\frac{1}{2}$ to 3 feet. Our description and figure are taken from a specimen from Kushiro, presented by the Sapporo Museum. We have compared this with a larger example from Nemuro in the museum of Hakodate. Others were examined in the same museum from Nemuro, Chishima, Settsu and Shifto River, in Hokkaido, and from Heigun River, in the province of Rikuchu, near Morioka.

This singular trout seems to be closely related to *Hucho hucho* of the Danube, differing from that species in its larger scales. The common name "Ito" (string) is suggested by its slender form.

(Named for Captain Blackiston, author of a treatise on the birds of Japan, whose interest in natural history was largely responsible for the growth of the museum of Hakodate.)

4. SALVELINUS (Nilsson) Richardson.

CHARRS.

Salvelini NILSSON, Prodr. Ichth. Scand., 1832, p. 7 (*alpinus*); group name.

Salvelinus RICHARDSON, Fauna Bor.-Amer., III, 1836, p. 169 (*alpinus*); after NILSSON.

Baione DE KAY, N. Y. Fauna; Fishes, 1842, p. 244 (*fontinalis*).

Umbla RAPP, Fische Bodensee, 1854, p. 32 (*umbla* = *alpinus*).

Body moderately elongate. Mouth large or small. Teeth of jaws, palatines, and tongue essentially as in *Salmo*, the hyoid patch present or not. Vomer boat-shaped, the shaft much depressed, without raised crest, with teeth on the head of the bone and none on shaft. Scales very small, 200 to 250 in a lengthwise series. Fins moderate, the caudal forked in the young, truncate in some species in the adult. Sexual peculiarities not strongly marked, the males with the premaxillaries enlarged and a fleshy projection at the tip of the lower jaw. Coloration dark, with round crimson spots, the lower fins sometimes with marginal bands of black, reddish, and pale. Species numerous in the clear streams and lakes of the northern parts of both continents, sometimes descending to the sea, where they lose their variegated colors and become nearly plain and silvery. The members of this genus are by far the most active and handsome of the trout, and live in the coldest, clearest, and most secluded waters. "No higher praise can be given to a Salmonoid than to say it is a charr."

(*salvelinus*, an old name of the charr; from the same root as *Sälbling* or *Saibling*.)

7. *SALVELINUS KUNDSCHA* (Pallas).

AMEMASU (RAIN SALMON); KUNDSCHA.

Salmo kundscha PALLAS, Zoogr. Rosso. Asiat., III, 1811, p. 250; Kamchatka.—JORDAN and GILBERT, Rept. U. S. Fur Seal Comm., III, 1898, p. 438, pl. XLV; Petropaulsky.

Salvelinus kundscha JORDAN and EVERMANN, Fish. N. and M. Amer., III, 1898, p. 2823; Petropaulsky, Tareinsky.

Salmo leucomænis PALLAS, Zoogr. Rosso. Asiat., III, 1811, p. 250; Kamchatka.—BREVOORT, Exped. Japan, p. 276, pl. x, fig. 3; Hakodate.—STEINDACHNER, Sitzber. Ak. Wiss. Wien, 1870, p. 15; Decastris Bay.—ISHIKAWA, Prel. Cat., 1897, p. 21; Shiribeshi, Hokkaido.

Salmo curilus PALLAS, Zoogr. Rosso. Asiat., III, 1811, p. 251; Kurile Islands.

Head $4\frac{1}{2}$ in length; depth $4\frac{1}{2}$; depth of caudal peduncle $2\frac{3}{8}$ in head; eye 5; interorbital space $2\frac{1}{2}$; snout $3\frac{1}{2}$; maxillary 2; D. 11; A. 10; scales in lateral series 210, in transverse series $35 + 40$. Maxillary projecting beyond eye, opercles very convex posteriorly; teeth on jaws and palatines weak, those of vomer restricted to a small anterior patch; branchiostegals 13; gill-rakers on first arch $5 + 10$, rather long, compressed. Height of dorsal $1\frac{1}{2}$ in head; caudal rather deeply forked, its length $1\frac{1}{10}$ in head; highest anal ray $1\frac{3}{8}$ in head; ventral appendage small, about one-third the length of fin. Body dark above, the spots on sides somewhat larger than pupil, arranged in 3 more or less distinct rows; dorsal and caudal dusky, without spots, the latter narrowly tipped with black; anal, ventrals, and pectorals white, the paired fins dusky above.

This species, common in the streams of Kamchatka, is occasionally taken in northern Japan. We have one fine specimen about 300 millimeters long, from Nemuro, the northernmost point in Hokkaido, presented by the museum of Sapporo. Another from Iturup Island was examined in the museum of Hakodate. A specimen from Shinbeshi is in the Imperial Museum.

8. *SALVELINUS PLUVIUS* Hilgendorf.

AMENOUWO (RAIN FISH); IWANA (ROCKLING); OSOROKOMA; TOKOSISU.

Salmo pluvius HILGENDORF, Monatsber. Ges. Ostasien, 1876, p. 25; Nikko.—ISHIKAWA, Prel. Cat., 1897, p. 21; Iturup, Tokazu, Aomori, Kodzuke, Kiso, Chichibu, Kaga, Kamo R.

Head 4 in length; depth $4\frac{1}{4}$; depth of caudal peduncle $2\frac{1}{2}$ in head; eye $5\frac{1}{8}$; snout $3\frac{3}{4}$; interorbital space $3\frac{1}{4}$; maxillary $1\frac{1}{8}$; D. 10; A. 9; scales in lateral series 200, in transverse series $41 + 41$; pores in lateral line 124. Head rather short, blunt, the interorbital space broad and convex; mouth large, the maxillary extending past eye a distance equal to diameter of pupil. Teeth on jaws weak, a single row on the palatines, a small cluster on anterior part of vomer, none on the shaft; teeth on the tongue in 2 rows, somewhat stronger than those of the

jaws, curved backward. Pseudobranchiæ small; gill rakers on first arch 6+9, rather long and slender. Dorsal and anal of equal height, the longest rays contained $1\frac{7}{8}$ times in head; caudal rather deeply notched, its length $1\frac{1}{2}$ in head; pectorals $1\frac{3}{8}$ in head; ventrals $1\frac{3}{8}$. Supplemental appendage of ventral slender, its length $2\frac{5}{8}$ in the fin.

Color in alcohol, body with numerous light spots about as large as pupil, ventral and anal fins edged anteriorly with bright yellow, upper surfaces of pectorals and ventrals dusky.

Described from an individual about 200 millimeters long from Lake Chuzenji. Specimens in Lake Chuzenji are pale gray in life, the spots on the sides crimson, those on the back grayish white; lower fins scarlet, dusky, shaded with whitish edge; in streams the colors are darker.

This beautiful little charr is abundant in the mountain streams and lakes of Hondo and Hokkaido. It reaches but a small size, the largest specimens seen by us not exceeding 2 pounds. Our specimens are from Lake Chuzenji, near Nikko (introduced), Chishima, Nemuro, Ohata River at Aomori and Kawagiri in Rikuchu. Numerous others from localities in Hokkaido are preserved in museums.

The species is very close to *Salvelinus malma* of Kamchatka and the Aleutian region, differing in the longer mouth and larger spots, traits which are constant in the material at our disposal.

(*pluvius*, rainy, the Latin equivalent of Amenouwo.)

9. SALVELINUS MALMA (Walbaum.)

MALMA.

Goltra KRASCHENINNIKOW, Descr. Kamch., 1768, p. 183; Kamchatka.

Malma PENNANT, Arctic Zoöl., Introd., 1792, p. 126; Bering Sea; after Steller, etc.

Salmo malma WALBAUM, Artedi Piscium, 1792, p. 66; Kamchatka; based on *Malma* of Pennant.

Salmo callaris PALLAS, Zoogr. Rosso-Asiat., III, 1811, p. 353; Bering Sea.—GÜNTHER, Cat., VI, 1866, p. 143.

Salmo lævigatus PALLAS, Zoogr. Rosso-Asiat., III, 1811, p. 385; Kurile Islands.

Salmo nummifer CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXI, 1848, p. 365; Kamchatka; on a drawing by Mertens.

Salmo erythrorhynchus CUVIER and VALENCIENNES, Hist. Nat. Poiss., XXI, 1848, p. 367; Kamchatka.

Salmo tudes COPE, Proc. Amer. Phil. Soc. Phila., 1873, p. 24; Captains Harbor, Unalaska. (Coll. Prof. George Davidson.)

Salvelinus malma JORDAN and GILBERT, Synopsis, 1883, p. 319.—EVERMAN, Bull. U. S. Fish. Comm., XI, 1891, p. 50, pl. xxv, fig. 1.—JORDAN and EVERMANN, Fish. N. and M. Amer., I, 1896, p. 508; III, 1898, p. 2823.—JORDAN and GILBERT, Rept. U. S. Fur Seal Comm., III, 1898.

Salmo fariopsis (Kner MS.) STEINDACHNER, Sitz. Ak. Wiss. Wien, 1870, p. 17, pl. 1, fig. 3; Decastris Bay, Manchuria.

Head $4\frac{1}{4}$ to $4\frac{3}{8}$; depth $4\frac{1}{4}$ to $4\frac{3}{8}$; D. 11; A. 9; scales about 40-240-36; pyloric cæca large, 40 to 50; gill-rakers about 8+12. Body rather elongate, the head comparatively small, the mouth small, the maxillary usually not reaching beyond line of eye. Caudal fin well forked;

lower fins short, the ventral reaching halfway to vent. Olivaceous or grayish, the sides with small, round red spots, much smaller than pupil; back with small whitish spots; lower fins dusky with a pale stripe in front followed by a dark one. Sea-run specimens silvery, with the spots faint or obsolete.

Length varying with the waters from 5 to 20 inches or more. Large specimens in the sea reaching 12 pounds.

Streams of Alaska and Kamchatka descending to the sea, very abundant throughout the Aleutian region and extending its range through the Kuriles to Okhotsk Sea. Probably *S. pluvius* is a southern variety of the species as is also the Dolly Varden trout, *Salvelinus parkii*, Washington, Oregon, and northern California.

The fish from the Japan Sea described and figured by Steindachner under the name of *Salmo fariopsis* agrees perfectly with the young of *Salvelinus malma*, and differs from the Japanese *Salvelinus pluvius* in the smaller size of the mouth and in the coloration. The northern species, *Salvelinus malma*, has been already recorded from the Kurile Islands.

(*malma*, a vernacular name in Kamchatka.)

3. PLECOGLOSSUS Schlegel.

Plecoglossus SCHLEGEL, Fauna Japonicus, Poiss., 1846, p. 229 (*altivelis*).

Body moderately elongate, covered with very small scales. Mouth wide, the premaxillaries with a few, small, conical, pointed teeth. Maxillaries and lower jaw with teeth of a peculiar form, lamelliform, broad, truncate, serrate, movable, seated in folds of skin; mandibles each ending in a small knob, not joined at the symphysis. Mucous membrane of interior of mouth between terminal halves of the mandible forming a peculiar organ, being raised in folds with two pouches in front and one behind. Tongue very small, with minute teeth, its top toothless; no teeth on vomer, palatines with teeth. Pyloric cæca very numerous. Eggs small. Small fishes inhabiting the clear streams of Japan and Formosa, migratory like the salmon, and among the very finest of food fishes. One species is known.

(πλέκος, anything folded or plaited; γλῶσσα, tongue).

10. PLECOGLOSSUS ALTIVELIS Schlegel.

AYU; HIUWO (RED-FISH); KOAYU (YOUNG AYU); NENGIO (ANNUAL FISH); KOGIO (FRAGRANT FISH).

Plecoglossus altivelis SCHLEGEL, Fauna Japonica, Poiss., p. 229, pl. cv, fig. 1; no locality.—GÜNTHER, Cat. Fish., VI, 1866, p. 165.—ISHIKAWA, Zool. Mag., Tokyo, VII, 1895, p. 129; Matsubara, Maebara; Prel. Cat., 1897, p. 19; Musashi, Tama, Yechigo, Kaga, Hasa R., Katsusa R., Mino, Uji R., Yamashiro, Kamo R., Tanba, Osaka, Tosa, Fukuoka, Higo, Maebara, Lake Biwa.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 349, Lake Biwa; Proc. U. S. Nat. Mus., 1900, p. 744; Numata, Tsushima.

Head $4\frac{3}{5}$ in length; depth $4\frac{1}{2}$; depth of caudal peduncle $2\frac{1}{2}$ in head; eye 5; snout $2\frac{5}{8}$; maxillary $1\frac{3}{4}$; D. 10; A. 15; scales in lateral series 156, between lateral line and insertion of dorsal 18.

Head small, the snout pointed. Mouth oblique, maxillary extending past eye a distance a little greater than diameter of pupil; the sheath of the upper jaw longer than that of the lower. Gill-rakers on first arch 16+19, short and very slender. Palatine teeth are present, though very small. Height of dorsal contained $6\frac{1}{2}$ times in length; anal $8\frac{1}{2}$; length of caudal $5\frac{1}{3}$; pectorals 7; ventrals 8. The above characters are shown by a specimen about 180 millimeters long. Larger individuals, measuring 225 millimeters, have deeper bodies, shorter heads, and higher dorsal fins. A specimen from the market at Hiroshima measures: Depth $3\frac{4}{5}$ in length; head $4\frac{1}{4}$; height of dorsal $5\frac{1}{3}$; anal $8\frac{1}{3}$; length of pectorals $6\frac{2}{3}$; ventrals $7\frac{1}{2}$; caudal $5\frac{1}{4}$. Occasionally the dorsal when depressed reaches the base of adipose fin. The dorsal

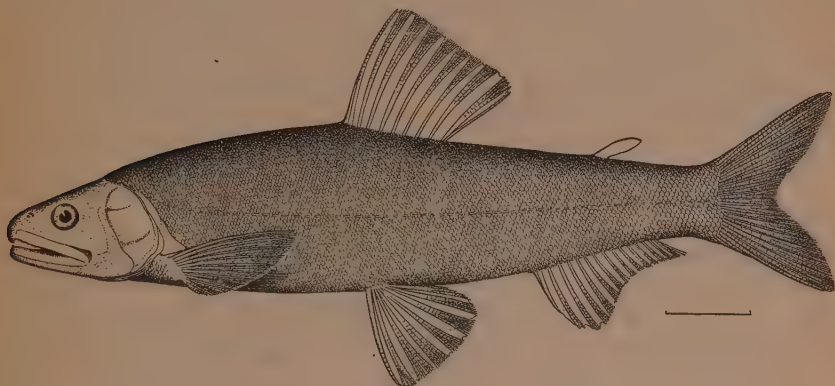


FIG. 4.—PLECOGLOSSUS ALTIVELIS (from Formosa).

rays number 10, occasionally 11, the anal 14 to 16. Color olivaceous, silvery below; always a light yellow bar or blotch above the middle of the pectoral on side; adipose fin edged with scarlet, dorsal somewhat shaded with dusky, anal with reddish. The young, to at least the length of 100 millimeters, have a broad silvery lateral band. The body is very elongate, the depth contained about $7\frac{1}{2}$ times in the length.

Our specimens are from Ishikari River, Niigata, Aomori, Same, Matsushima, Sendai, Morioka, Tokyo, Tanagawa River at Tachikawa, Daiya River at Nikko, Gifu, Lake Biwa, Osaka, Wakanoura, Kobe, Hiroshima, Kurume, Nagasaki, and Tan Sin River at Taihoku, the capital of Formosa. Specimens from Formosa are a little larger than any from Japan, and with the anal possibly a little longer as compared with the head. This form is apparently not different specifically. At Gifu and Tachikawa, tame cormorants are largely in the capture of the Ayu, which is the most delicious of all Japanese food-fishes.

(*altus*, high; *velum*, sail.)

Family II. ARGENTINIDÆ.

THE SMELTS.

Body elongate, covered with moderate or small scales, which are usually cycloid. Head naked. Mouth terminal, small or large, formed as in the *Salmonidæ*, the maxillary forming the margin of the upper jaw. Teeth various, sharp-pointed. Gills 4, a slit behind the fourth. Gill membranes separate, free from the isthmus, with 6 to 10 branchiostegals. No barbels. Stomach a blind sac, with the pyloric cæca few or none. Dorsal fin short, nearly median; adipose fin always present; caudal forked; anal moderate; pectorals placed low; ventrals moderate, nearly median; no spines in the fins. Lateral line present. No phosphorescent spots. Abdomen rounded. Air bladder large, single. Ova large, falling into the cavity of the abdomen before extrusion. Small fishes, marine or anadromous, some of them inhabiting deep water; all but one genus confined to the waters of the Northern Hemisphere. There are about ten genera and perhaps a dozen species; reduced *Salmonidæ*, smaller and in every way feebler than the trout, but similar to them in all respects except the form of the stomach. Most of them are very delicate food-fishes.

- a. Branchiostegals 6 to 10; body not cylindrical, the sides more or less compressed; gill membranes separate.
- b. Mouth large, with strong teeth in the jaws and on tongue.
 - c. Scales large, smooth, similar in both sexes; pectoral fin moderate, its rays 10 to 12; ventrals inserted under front of dorsal; teeth strong, those on tongue enlarged, canine-like; scales moderate, loosely attached. *Osmerus*, 6.
 - bb. Mouth rather small, with weak teeth or none; scales large, smooth; ventrals below middle or front of dorsal.
 - d. Jaws with minute teeth; similar teeth on tongue and palate; maxillary reaching past front of eye. *Mesopus*, 7.
 - dd. Jaws toothless, or very nearly so; vomer and palatines with small teeth; mouth very small, the maxillary not reaching past front of eye; tongue with a curved row of small teeth on each side; scales usually more or less spinescent. *Argentina*, 8.

6. OSMERUS (Linnæus) Lacépède.

SMELTS.

Osmeris LINNÆUS, Syst. Nat., 10th ed., 1758, p. 310 (*eperlanus*).

Osmerus LACÉPÈDE, Hist. Nat. Poissons, V, 1803, p. 229.

Eperlanus GAIMARD, Voy. Island and Grœnland, 1851 (*eperlanus*).

Spirinchus JORDAN and EVERMANN, Fish. N. and M. Amer., 1896, I, p. 522 (*thaleichthys*).

Body elongate, compressed. Head long, pointed. Mouth wide, the slender maxillary extending to past the middle of the eye; lower jaw projecting; preorbital and suborbital bones narrow. Maxillaries and premaxillaries with fine teeth; lower jaw with small teeth, which are larger posteriorly; tongue with a few strong, fang-like teeth, largest

at the tip; hyoid bone, vomer, palatines, and pterygoids with wide-set teeth. Gill-rakers long and slender. Branchiostegals 8. Scales large, loose, 60 to 70 in the course of the lateral line. Dorsal small, about midway of the body, over the ventrals; anal rather long. Vertebrae about 40. Pyloric caeca small, few. Small fishes of the coasts of Europe and northern America, sometimes ascending rivers; delicate in flesh and considerably valued as food.

(ὀσμηρός, odorous; the name is equivalent to the English "smelt.")

II. OSMERUS DENTEX Steindachner.

KUORI-UWO (CUCUMBER-FISH).

Osmerus dentex STEINDACHNER, Sitzungsber. Kais. Akad. Wiss. Wien, LXI, 1870, p. 429; Decastria Bay, northern China.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 349; Tokyo Market, Hakodate.—JORDAN and GILBERT, Synopsis, 1883, p. 293.—TURNER, Contr. Nat. Hist. Alaska, 1886, p. 102, pl. x.—NELSON, Rept. Nat. Hist. Coll. Alaska, 1887, p. 313.

Osmerus eperlanus ISHIKAWA, Prel. Cat., 1897, p. 19; Nemuro; Tokadzu. (not of Linnaeus).

Head $\frac{1}{2}$ in length; depth 6; depth of caudal peduncle $4\frac{1}{2}$ in head; eye 5; snout $3\frac{1}{2}$; interorbital space $4\frac{1}{2}$; D. 10; A. 15; scales in lateral series 70; between lateral line and dorsal 8. Body long, slender, compressed, caudal peduncle narrow; head long, sharp, pike-like. Snout long, pointed, the lower jaw slightly projecting, maxillary extending to posterior edge of orbit, its length contained about 2 times in head. Teeth on maxillaries and premaxillaries minute; 2 to 4 large sharp teeth on anterior edge of vomer, a row of smaller teeth on the palatines, and a similar row opposite the latter and extending farther back on the pterygoids; lower jaw with a row of rather large teeth; tongue with fang-like teeth, the anterior ones largest. Pseudobranchiae present; gill-rakers on first arch 9 + 18, very long and slender. Scales large, cycloid, loosely attached. Lateral line straight, extending along middle of body. Dorsal inserted near middle of body, its longest rays contained $1\frac{1}{2}$ in the head; height of anal $2\frac{2}{3}$; caudal deeply forked, $1\frac{1}{2}$ in head; pectoral rays 12, the longest $1\frac{1}{2}$ in head; ventral rays 8, 2 in head.

Color in alcohol, brownish above, white below, the sides silvery; scales narrowly edged with brown except on the ventral surface of body. In life back pale olive, the scales edged with darker; sides above lateral line purple, changing to blue, violet, and gold; belly satin white; fins slightly golden. The above description is from a specimen 250 millimeters long, collected at Kushiro. A somewhat smaller specimen from Tokyo measures as follows: Head $3\frac{5}{8}$ in length; depth $4\frac{5}{8}$; depth of caudal peduncle $3\frac{3}{8}$ in head; eye 5; snout $3\frac{1}{8}$; interorbital space $4\frac{1}{8}$; D. 10; A. 15; P. 12.

A fish brilliantly colored in life, the flesh of firmer texture than in

the rest of the genus. Coast of Alaska south to Manchuria and northern Japan, abundant northward; our specimens are from Kushiro, Hakodate, and the market of Tokyo, whither they may have been brought from the north.

(*Dentex*, toothed.)

7. MESOPUS Gill.

(SURF SMELTS.)

Mesopus GILL, Proc. Ac. Nat. Sci. Phila., 1862, p. 14 (*pretiosa*).¹

Hypomesus GILL, Proc. Ac. Nat. Sci. Phila., 1862, p. 15 (same definition, no type named).

Body rather elongate, moderately compressed, covered with thin scales of moderate size. Head rather pointed. Mouth moderate, the shortish maxillary not extending quite to middle of eye; its outline below broadly convex; lower jaw projecting. Teeth minute, on jaws, vomer, palatines, pterygoids, and tongue. Ventrals inserted under middle of dorsal or rather before it. Branchiostegals 6 to 7. North Pacific.

(μέσος, middle; πούς, foot; in allusion to the rather backward position of the ventrals.)

- a. Ventrals inserted immediately below or anterior to first ray of dorsal; anal rays 16; dorsal 8 or 9.....*olidus*, 12.
 aa, Ventrals inserted below second or third dorsal ray; anal rays 12 or 13, dorsal 10.....*japonicus*, 13.

12. MESOPUS OLIDUS (Pallas).

CHIKA; AMASAGI (SWEET SAGI OR SMELT).

Salmo (*Osmerus*) *olidus* PALLAS, Zoogr. Ross.-Asiat., III, 1811, p. 391; lakes and rivers of Kamchatka.

Mesopus olidus GÜNTHER, Cat., VI, 1866, p. 169, in part.

Hypomesus olidus, ISHIKAWA, Prel. Cat., 1897, p. 19; Hitaka, Nemuro, Kaga, Tsuchiura.—JORDAN and EVERMANN, Fishes N. and M. Amer., I, 1896, p. 525.

Head $4\frac{1}{2}$ in length; depth $5\frac{1}{4}$; depth of caudal peduncle $2\frac{5}{8}$ in head; eye $3\frac{4}{5}$; interorbital space 5; snout $3\frac{4}{5}$; D. 9; A. 16; scales in lateral series 57; in transverse series 13.

This species closely resembles *M. japonicus*, differing from it noticeably in the longer anal fin, which has 15 or 16 rays, the shorter dorsal of 8 or 9 rays, and the more anterior position of the ventrals, which are inserted below or anterior to first dorsal ray. The maxillary is usually longer in this species, extending to middle of pupil or as far as the posterior border. A careful study of more material may prove this and the next species to be the same. Many specimens from Aomori have the dorsal rays 9, sometimes 8, the anal 16, the scales in

¹ By inadvertence these two synonymous names were applied to this genus by Gill. *Mesopus* has priority of a page and has also a type indicated.

lateral series 57 to 62; two specimens from Same have the dorsal rays 9, anal 14 and 15, scales 57; one from Matsushima has dorsal 9, anal 15, scales 56. Two specimens from Grantley Harbor and two from Port Clarence, which we identify with this species, have the dorsal rays 8 or 9, anal 14, scales 57 to 60.

Common in northern Japan, inhabiting the bays in large numbers. Our specimens are from Aomori, Same, and Matsushima. It ranges northward to Kamchatka and eastward to Alaska.

(*Olidus*, oily.)

13. MESOPUS JAPONICUS Brevoort.

CHIKA; WAKASAGI (YOUNG SAGI).

Osmerus olidus (called *Osmerus japonicus* on plate) BREVOORT, Exped. Japan, 1856, p. 278, pl. x, fig. 2; Hakodate.

Osmerus oligodon KNER, Fische. Naturh. Museum, Godeffroy, 1865, p. 9, pl. xiv, fig. 1; Decastris Bay, Manchuria.

Mesopus olidus GÜNTHER, Cat., VI, 1866, p. 169; in part.

Head 5 in length; depth $5\frac{1}{2}$; depth of caudal peduncle 3 in head; eye 4; interorbital space $3\frac{3}{4}$; snout 4; D. 9; A. 13; scales in lateral series 65, in transverse series between ventral and dorsal 14.

Body long, somewhat compressed, the head short and pointed. Interorbital space broad, flat, or slightly convex. Snout about equal in length to diameter of orbit, pointed, the lower jaw slightly projecting; mouth small, the maxillary extending to a vertical through anterior edge of pupil, lower outline of maxillary convex, rounded posteriorly. Teeth minute, on jaws, vomer, palatines, pterygoids, and tongue, those on the tongue largest. Pseudobranchiæ present. Gill-rakers on first arch $9 + 21$, very long and slender. Scales large, smooth, easily displaced. Lateral line not very conspicuous, passing along the eighth series of scales below dorsal. Dorsal inserted near middle of body, half way between tip of snout and base of caudal fin, the anterior rays highest, $1\frac{2}{3}$ in head. Anal low, the highest rays $2\frac{2}{3}$ in head. Caudal deeply forked, about equal to length of head. Ventrals inserted below second or third dorsal ray, $1\frac{1}{2}$ in head. Pectoral rays 13; length $1\frac{2}{3}$ in head.

Alcoholic specimens show a broad, silvery lateral band alongside of body, the scales on upper half of body edged with dusky dots, the top of head dark.

The figure named *Osmerus japonicus* by Brevoort, though crude, serves well to distinguish this species from *Mesopus olidus*. The posterior position of the ventrals and the short anal base are distinctly shown. In *Mesopus olidus* the ventrals are inserted immediately below or anterior to the first ray of the dorsal, and the anal base is longer, the fin having 16 rays.

We have two specimens of *Mesopus japonicus* about 170 millimeters

long, the one from Kushiro, presented by Mr. Nozawa, naturalist of the Hokkaido Museum at Sapporo, the other from Aomori. The specimen from Kushiro has 67 scales in the lateral series and 12 anal rays. The species is probably less abundant in Japan than *Mesoprus olidus*.

8. ARGENTINA (Artedi) Linnæus.

Argentina (ARTEDI) LINNÆUS, Syst. Nat., 10 ed., 1758, p. 315 (*sphyræna*).

Silus REINHARDT, Bemærkinger Skandinavisk Ichthyol., 1833, p. 11 (*silus*).

Acantholepis KRÖYER, Danmarks Fiske, III, 1846-49, p. 98 (*silus*).

Body oblong, covered with rather large cycloid scales, which are more or less rough with spinous points. Mouth small, the maxillaries very short, not reaching to the eye; eye very large. Jaws toothless; an arched series of minute teeth on the head of the vomer and on the forepart of the palatine; tongue with a series of small curved teeth on each side. Dorsal fin short, in advance of the ventrals; caudal fin deeply forked. Eggs small. Pyloric cæca present. Branchiostegals 6. Fishes of deep or cold waters, never entering fresh streams. (Latin *argentum*, silver.)

14. ARGENTINA KAGOSHIMÆ Jordan and Snyder, new species.

Head $3\frac{1}{2}$ in length; depth $7\frac{1}{2}$; depth of caudal peduncle $4\frac{1}{6}$ in head; eye $3\frac{1}{6}$; snout 3; interorbital space 4; maxillary $5\frac{2}{3}$; D. 9; A. 10; P. 15. Body elongate, somewhat compressed, the caudal peduncle short. Head very long, as wide and deep as body, flat above. Snout

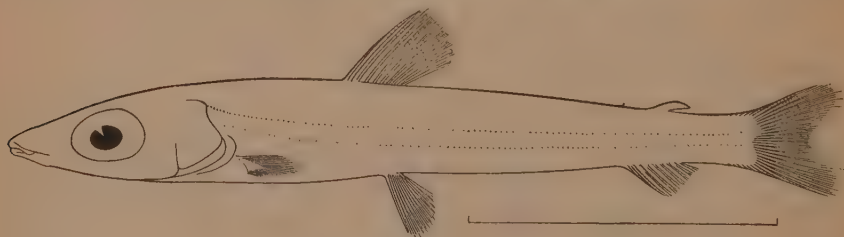


FIG. 5.—*ARGENTINA KAGOSHIMÆ*.

pointed, jaws equal, maxillary not reaching over halfway to eye, mouth small. No teeth on jaws, a small patch of minute teeth on anterior end of vomer, a few large curved teeth near tip of tongue. Eye very large, the diameter about equal to length of snout, interorbital space broad, slightly concave in the middle. Pseudobranchiæ well developed; gill-rakers on first arch reduced to a few mere elevations. Body covered with large, loosely imbedded, smooth scales. The two specimens at hand are so poorly preserved that the number of scales can not be told, nor can the shape or measurements of the fins be given. Dorsal inserted anterior to ventrals, the latter immediately below the last ray of the former. Anal inserted a distance from base

of caudal equal to space between tip of snout and posterior border of orbit. Adipose fin rather high, the base short. A silvery band about as wide as the pupil extending along middle of sides, opercle silvery, upper part of eyes black, the iris silvery. Two specimens about 70 millimeters long, from Kagoshima in Kiusiu, presented by Professor Mitsukuri. Type No. 6854, Leland Stanford Junior University Museum, the cotype presented to the U. S. National Museum.

Family III. SALANGIDÆ.

ICE-FISHES.

Body slender, translucent, elongate, compressed, naked or with a few exceedingly thin, large, deciduous scales. Head elongate, much depressed, with long, flat, pointed snout. Eye small. Cleft of mouth wide; jaws and palatines with pointed teeth, some of those in front being enlarged; no teeth on vomer; tongue with teeth; branchiostegals 4. Dorsal fin inserted before anal far behind ventrals; anal many rayed; adipose fin present, small; caudal forked; pseudobranchiæ well developed; alimentary canal straight, without bend; no pyloric cæca; no air bladder; eggs small.

Small translucent fishes somewhat resembling very young salmon, running in the rivers of Japan, Korea, and China.

9. SALANX Cuvier.

Salanx CUVIER, Règne Animal, 1st ed., 1817, p. 185; (cuvieri, "une espèce encore nouvelle").

Leucosoma GRAY, Zoological Miscellany, 1831, p. 4 (reevesi).

Salangichthys BLEEKER, Act. Soc. Sci. Nederl., VII, Japan, VI, p. 100, (microdon).

The characters of the single genus are included above. Two subgenera may be recognized, *Salanx*, the "Chinese Whitebait," in China and Korea, with two species (*chinensis* and *hyalocranius*), and *Salangichthys* in Japan, with two species (*microdon* and *ariakensis*). The latter subgenus is distinguished mainly by its feeble dentition, the canines being small. The head is shorter and less depressed in *Salangichthys*.

(σαλάχς, name of some unknown fish; from σαλάσσω, to crowd or cram.)

a. SALANGICHTHYS. Canines small; head short, relatively narrow.

ab. Anal rays 23 microdon, 15

bb. Anal rays 26 kriakensis, 16

15. SALANX MICRODON Bleeker.

SHIRA-UWO (WHITE-FISH); HIRAO (FLAT-TAIL); HIAGIO (ICE-FISH).

Salanx (*Salangichthys*) *microdon* BLEEKER, Act. Soc. Sci., Indo. Nederl., VII, Japan, VI, p. 100; Jeddo (Tokyo).

Salanx microdon GÜNTHER, Cat. Fish., VI, 1866, p. 206; Jeddo.—ISHIKAWA, Prel. Cat. 1897, p. 19; Tokyo, Tsuchiura.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 850; Tokyo.

Head 6 in length; depth at insertion of anal $8\frac{1}{2}$; depth of caudal peduncle 4 in head; eye $4\frac{5}{8}$; interorbital space $5\frac{1}{2}$; snout $3\frac{1}{10}$; D. 11; A. 23; P. 15. Body very elongate, cylindrical anteriorly, compressed posteriorly, especially in male specimens, where, in the region of insertion of anal, the depth is double that of the body immediately behind the head; the females are more slender; caudal peduncle rather narrow and compressed. Head greatly depressed, flat or slightly rounded on top, snout spatulate; pointed when seen from the side. Maxillary extending to anterior edge of orbit; lower jaw projecting slightly beyond the upper; teeth in a single row on jaws and palatines, none on vomer, those on the premaxillaries enlarged; tongue with a few small teeth. Gill-rakers on first arch $3+12$, long and slender. Head and body naked, a single large, thin scale extending along body at base of anal fin in the male, the width of the anterior part of the scale equal to distance between the eyes. Dorsal inserted on posterior third of body, the highest rays contained two times in head. Adipose fin low, the length of its base about equal to depth of caudal peduncle. Caudal fin deeply forked, the lower rays slightly longer than the upper, equal to length of head. Anal inserted below middle of dorsal, the length of its base equal to length of head, the longest rays $1\frac{2}{5}$ in head. Ventrals inserted near middle of body, of 7 rays, the outer one longest, $1\frac{1}{3}$ in head, its tip somewhat filamentous. Pectorals falcate, $1\frac{1}{5}$ in head.

Color translucent, except for the eyes, the fish being almost invisible in the water; two rows of black dots along the ventral surface.

The straight alimentary canal, the distinct muscle segmentation, the very thin ventral wall of the abdominal cavity, and other characters suggest a larval stage of development. Specimens about 100 millimeters long are apparently mature, having large eggs in the ovaries.

This little fish is found at certain seasons in the bays of northern Japan in great abundance, probably ascending the streams to spawn. It reaches a smaller size than its allies *Salanx chinensis* of southern China and *Salanx hyalocranius* of Korea and northern China. Our many specimens are from Mororan, Aomori, Same, and Tokyo.

It is reported in Japan that the fish is annual, ascending the streams in summer, and all individuals dying in the autumn after the deposition of the eggs. This alleged fact needs verification.

(μικρός, small; ὀδόν, tooth.)

16. *SALANX ARIAKENSIS* Kishinouye, MS.

"B. 3. D. 13. A. 26. P. 10. V. 7.

"Length of the head $5\frac{1}{2}$ times contained in the total; head nearly twice as broad as high; the diameter of the eye is about one-seventh of the length of the head. Teeth subequal. Tongue toothless. Root of the ventral fin in the middle of the total length. Dorsal fin opposite to the anal. Adipose fin originates from the base of the anal. Body scaleless and nearly colorless, except a few black spots in two rows along the ventral median line and the caudal fin, which is light brown.

"This description is based upon two specimens about 16 cm. in length. They were collected from a weir in the Ariake Sea (Kiushiu) by Mr. Kamesaburo Toyama, on July 19, 1901. I can not tell the sex of these specimens, as the sexual gland is not yet ripe". (Kishinouye.)

The above account is from advance manuscript, kindly furnished to us by Dr. Kamekichi Kishinouye, chief of the Imperial Fisheries Bureau in Tokyo. This description will also be published in Tokyo.

RECAPITULATION.

Family I. SALMONIDÆ.

1. *Oncorhynchus* Suckley.
 1. *masou* (Brevoort); Aomori, Ishikari R. at Sapporo, Daiya R. at Nikko.
 2. *keta* (Walbaum); Ishikari River, Aomori, Hakodate.
 3. *kisutch* (Walbaum); Otaru, Ura R., Osatsubo, Aomori.
 4. *nerka* (Walbaum); Akan Lake in Kushiro, Urup I.
2. *Salmo* Linnæus.
 5. *perryi* Brevoort; Aomori, Niigata, Lake Chuzenji, Kinu R., Daiya R., Otani R., Kamehane, Maebara, Karasaki, Kawagiri, Kitakami R., Hakodate, Tokyo market.
3. *Hucho* Günther.
 6. *blackistoni* (Hilgendorf); Nemuro, Chishima, Settsu, Shifto R., Heigun R.
4. *Salvelinus* Richardson.
 7. *kundscha* (Pallas); Nemuro, Iturup I., Shinbeshi.
 8. *pluvius* Hilgendorf; Lake Chuzenji, Chishima, Nemuro, Ohata R., Kawagiri.
 9. *malma* (Walbaum).
5. *Plecoglossus* Schlegel.
 10. *attivelis* Schlegel; Ishikari R., Niigata, Aomori, Same, Matsushima, Morioka, Sendai, Tokyo, Tana R., Nikko, Gifu, Lake Biwa, Osaka, Wakanoura, Kobe, Hiroshima, Kurume, Nagasaki, Tan Sin R., Taihoku, Formosa.

Family II. ARGENTINIDÆ.

6. *Osmerus* Lacépède.
 11. *dentex* Steindachner; Kushiro, Hakodate, Tokyo market.
7. *Mesopus* Gill.
 12. *olidus* (Pallas); Aomori, Same, Matsushima.
 13. *japonicus* Brevoort; Kushiro, Aomori.
8. *Argentina* Linnæus.
 14. *kagoshimæ* Jordan and Snyder; Kagoshima.

Family III. SALANGIDÆ.

9. *Salanx* Cuvier.
 15. *microdon* Bleeker; Mororan, Aomori, Same, Tokyo.
 16. *ariakensis* Kishinouye; Ariake.

A REVIEW OF THE LABROID FISHES AND RELATED FORMS FOUND IN THE WATERS OF JAPAN.

By DAVID STARR JORDAN and JOHN OTTERBEIN SNYDER,
Of the Leland Stanford Junior University.

In the present paper is given a review of the species of Pharyngognathus fishes (Pomacentridæ, Labridæ, and Scaridæ) known to inhabit the waters of Japan. It is based on the collections made by the writers in the summer of 1900, under the auspices of the Hopkins Seaside Laboratory of Stanford University. Series of the species obtained have been deposited in the United States National Museum. The authors are indebted to Mr. Michitaro Sindo for important aid in the comparison of specimens.

In the descriptions the length of the head is measured from tip of snout to posterior border of opercle, the soft opercular flap not taken into account. The length of the snout is the distance between the tip of upper jaw, including the teeth, and the anterior edge of the orbit. The first anal spine is in some cases so very small that it is difficult to see with the unaided eye. The scales of the lateral series are counted to base of caudal rays, those on the fin not considered. On the cheek the scales are counted in series between eye and angle of preopercle. The accompanying illustrations are by Chloe Lesley Starks and Charles Bradley Hudson.

Family I. POMACENTRIDÆ.

Body short, deep, compressed, covered with ctenoid scales of varying size; lateral line wanting posteriorly; mouth small, usually with rather strong teeth, either conic or incisor-like; vomer and palatines toothless; nostril single on each side, nearly round; preopercle with its posterior edge largely free, serrate or entire; preorbital sheathing the small maxillary; dorsal fin single, with numerous strong spines, the spinous portion longer than the soft, which is similar to the soft anal, both fins scaly at base; anal spines 2; ventral fins thoracic, I, 5, the anterior rays longest, usually filamentous; a scaly appendage at base of ventral. Lower pharyngeals fully united; branchiostegals 5

to 7; gills $3\frac{1}{2}$, the slit behind the last gill very small or obsolete; gill rakers rather long and slender; no labyrinthiform appendage; air bladder and pseudobranchiæ present, well developed; pyloric cæca 2 or 3; gill membranes free from the isthmus. Vertebrae $12+14=26$. Fishes of the tropical seas, similar in mode of life to the Chætodontidæ, feeding on small marine animals and plants in the coral reefs. Most of them are too small to be used as food. They are very active in life and the coloration is usually brilliant, sometimes changing much with age. The family shows strong affinities with the Labridæ in its gill structures and pharyngeals. In other respects it approaches the Kyphosidæ, while the unique character of the simple nostril is shared with the Cichlidæ only, from ancestors of which group the Pomacentridæ are probably descended.

I. Scales moderate or large, 25 to 50 in lengthwise series.

- a. Teeth fixed, conical or incisor-like, covering nearly the whole free edge of each jaw; carnivorous species.
- b. Teeth conical, not flattened nor incisor-like.
 - c. Teeth in one series; preorbital and all the opercular bones serrate, the teeth on the opercle and interopercle very strong; dorsal spines 9 to 11; scales small (about 50) *Amphiprion*, 1.
 - cc. Teeth in 2 to 4 series, the outer enlarged and bluntish; preopercle entire; scales large; body oblong; lateral line wanting on tail; scales large; dorsal spines 12 or 13 *Chromis*, 2.
- bb. Teeth more or less flattened or incisor-like, in 1 or 2 series.
 - d. Preopercle and usually preorbital also, sharply serrate.
 - e. Teeth entire, mostly uniserial; preorbital not very deep, its edge not notched; scales large; dorsal spines 12 or 13 *Pomacentrus*, 3.
 - dd. Preopercle and preorbital strictly entire; snout naked; suborbitals not adnate to the cheeks.
 - e. Teeth not emarginate, arranged in two series *Chrysiptera*, 4.
 - ee. Teeth emarginate or Y-shaped, in one series; preorbital moderate; scales large; dorsal spines 12 or 13 *Glyphisodon*, 5.

1. AMPHIPRION Schneider.

Amphiprion SCHNEIDER, Syst. Ichth. Bloch, 1801, pp. 47, 200 (*ephippium*).

Prochilus (Klein, Pisces Missus, V, p. 60, nonbinomial.) BLEEKER, Maatsch. Wet., II, 1877, p. 20 (*ephippium*).

Body short and deep, covered with rather small roughish scales, about 50 in a longitudinal series; preorbital serrate, without large spine; all the opercular bones strongly serrate; teeth in one row, small, conical; dorsal spines 9 to 11. Coloration bright, with usually one or more sharply defined bluish white cross bands. Tropical seas, abounding about coral reefs.

(ἄμφι, everywhere; πρίων, saw.)

- a. Dorsal rays IX, 19; one broad, pearl-colored cross band, on the head and nape. *frenatus*, 1.
- aa. Dorsal rays X, 16; three pearl-colored bands on head and body *polymnus*, 2.

1. AMPHIPRION FRENATUS Brevoort.

Amphiprion frenatus BREVOORT, Exped. Japan, 1856, p. 263, pl. vi, fig. 4; Nafa, Okinawa Islands, Riukiu Archipelago.—GILL, Proc. Acad. Nat. Sci. Phila., 1859, p. 148; Shimoda.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 752; Okinawa, Shimoda.

Amphiprion tricolor ISHIKAWA, Prel. Cat., 1897, p. 31; Riukiu, not of Günther.

Head $3\frac{1}{2}$ in length; depth $1\frac{9}{10}$; depth of caudal peduncle 6; eye $3\frac{1}{2}$ in head; interorbital space $2\frac{3}{4}$; snout $3\frac{1}{2}$; D. IX, 19; A. II, 15; scales in lateral line 46; in series between lateral and insertion of dorsal 7; between lateral line and insertion of anal 20.

Body short, deep, and compressed; head rounded anteriorly, the snout short; interorbital space convex. Mouth almost vertical, the lower jaw projecting; maxillary not extending to eye, suborbital with a strong spine on anterior part, posterior to which is a row of shorter spines; preopercle strongly serrate; opercle, interopercle, and subopercle with radiating ridges which end in sharp spines. Gill-rakers on first arch about 17, long and slender near middle of arch, growing very short toward the ends.

Head and body covered with ctenoid scales; a naked area on interorbital space, snout, and chin; very small scales extending outward on dorsal, anal, and caudal fins. Lateral line incomplete, ending below base of eleventh dorsal ray. Fourth dorsal spine longest, $2\frac{1}{2}$ in head; posterior rays of dorsal and anal longest, $1\frac{3}{8}$ in head. Caudal rounded, $1\frac{1}{8}$ in head. Pectorals and ventrals rounded.

Color in spirits, bright chocolate brown without bands or stripes, lighter below, in the region of the pectoral fins and on snout and chin; a sharply defined bluish-gray collar bordered by a narrow band of pearly white and this in turn by brownish black, the width about equal to diameter of orbit, passing upward from the subopercle, behind the eye and over the back, just anterior to base of first dorsal spine. Fins yellowish, the spine of ventral brown.

This description is of a specimen about 92 millimeters long from Okinawa. Two other specimens taken at Shimoda by Mr. Morrow, of Commodore Perry's expedition, were also examined. These were the basis of Gill's account of *Amphiprion frenatus*, a species originally described from Okinawa. They have the body of a pale, yellowish-brown color with 3 light lateral bands extending along the sides, wider apart and broader anteriorly, converging and becoming narrower on the caudal peduncle; many scales of the body have each a small light spot. The width of the light collar varies somewhat in each individual. The Shimoda specimens measure as follows: Depth 0.56 of length, scales 7-48-20, D. IX, 19, A. II, 14; depth 0.60, scales 7-47-20, D. IX, 17, A. II, 14.

Though these specimens differ somewhat in color and in the depth of body, they probably all belong to the same species. From *Amphiprion macrostomus*, the most nearly related species, described by

Bleeker, they differ in having but 9 dorsal spines; in form and color they differ but little, save that in the latter the anal and ventrals are blackish, not yellow. The name *frenatus* was used prior to that of *macrostomus*.

(*frenatus*, with a bridle.)

2. AMPHIPRION POLYMNUS Linnæus.

Perca polymna LINNÆUS, Syst. Nat., 10th ed., I, 1758, p. 291; Indies.

Amphiprion polymnus BLOCH and SCHNEIDER, Syst. Ichth., 1801, p. 203.—STEINDACHNER, Ichth. Mitth., VII, 1861, p. 79.—BLEEKER, Holl. Maats., 1877, p. 28; Sumatra, Nias, Singapore, Bangkok, Java, Celebes, Flores, Solor, Amboyna, Ceram, Banda, Goram, Philippines, etc.

Sparus mylius BORY, Dict. Classique, pl. cxiii.

Amphiprion chrysopterus CUVIER and VALENCIENNES, Hist. Poiss., V, 1836, p. 301; locality unknown.—GÜNTHER, Cat. Fish., IV, 1862, p. 8.

Amphiprion xanthurus CUVIER and VALENCIENNES, Hist. Poiss., V, 1830, p. 402; Ile de France.—GÜNTHER, Cat. Fish., IV, 1862, p. 5; Batavia.—ISHIKAWA, Prel. Cat., 1897, p. 31; Kii, Riukiu.

Anthias clarkii BENNETT, Fishes Ceylon, 1830, p. 29; Ceylon.

Amphiprion clarkii CUVIER and VALENCIENNES, Hist. Poiss., IX, 1833, p. 504.—GÜNTHER, Cat. Fish., IV, 1862, p. 5; Amboina, Singapore, Mozambique, China.—DAY, Fishes India, I, p. 378.

Amphiprion japonicus SCHLEGEL, Fauna Japonica, 1846, p. 66; Nagasaki.—RICHARDSON, Ichth. China, 1846, p. 254; Canton.

Amphiprion chrysargurus RICHARDSON, Ichth. China, 1846, p. 254; Canton.

Amphiprion milii THIOLLIÈRE, Fauna Woodlark, p. 198; Woodlark Island.

Amphiprion bicinctus PLAYFAIR, Fishes Zanzibar, p. 80; Zanzibar.

Amphiprion boholensis CARTIER, Phys. Soc. Wurzburg, V, p. 96.

D. X, 16; A. II, 14; scales in lateral series 55; in transverse series 6+19.

Ground color brown or black, with three pearl-colored cross bands, the last around the tail; thorax and chin, pectoral, ventral, and caudal fins yellow; dorsal fin black. The dorsal fin is scarcely notched and has the spines stout and short. The height of the body is rather less than one-half of the total length (caudal not included); the caudal fin is emarginate. (Günther.)

We have not seen this species and adopt the views of Dr. Bleeker and Dr. Günther as to its synonymy. The species must be rare in Japan, having been taken only at Nagasaki and in the province of Kii.

The variations in color indicating local or other varieties have been indicated as follows:

a. Ventrals and anal yellow: *polymnus*.

aa. Ventrals and anal dusky or black; pectoral half black: *chrysargurus*.

aaa. Ventrals yellow; anal black: *clarkii*.

aaaa. All the fins black: *boholensis*.

aaaaa. Ventrals and anal edged with black: *japonicus*.

In case these forms should prove distinct species, the Japanese form would stand as *Amphiprion japonicus*.

(*polymnus*, a classical proper name; πολύς, many; ὕμνος, song.)

2. CHROMIS Cuvier.

Chromis CUVIER, Mémoires du Mus. d'Hist. Nat., 1815 (*chromis*).

Heliastes CUVIER and VALENCIENNES, Hist. Nat. Poiss., V, 1830, p. 495 (*insolatus*).

Furcaria POEY, Memorias Cuba, II, 1860, p. 194 (*puncta*=*multilineatus*).

Ayresia COOPER, Proc. Cal. Ac. Sci., 1863, p. 73 (*punctipinnis*).

Heliastes GÜNTHER, corrected spelling.

Body oblong or ovate, the depth two-fifths to two-thirds the length of the body without caudal. Preopercle entire, or nearly so; lateral line wanting on tail. Mouth small; teeth conical, in 2 or more series, the outer series enlarged and blunt. Scales rather large, 24 to 30 in a longitudinal series; suborbital and lower jaw scaly. Dorsal fin with 12 to 14 spines and 9 to 14 soft rays; caudal more or less forked, the lobes rounded or acute. Branchiostegals normally 5. Pyloric cæca 2. Gillrakers long and slender. Tropical seas; species numerous, varying considerably in form, perhaps divisible into smaller genera.

(*χρόμις*, the ancient name of some fish, probably a Sciaenoid, from *χρέμω*, to neigh, from the noise made by the fish.)

3. CHROMIS NOTATUS (Schlegel).

SUZUMEDAI (SWALLOW TAI); ABURA UWO (OILY-FISH); DOGORO (FOOLISH); GONGORO (FOOLISH).

Heliastes notatus SCHLEGEL, Fauna Japonica, 1846, p. 66; Nagasaki.—GÜNTHER, Cat. Fish., IV, 1862, p. 63; Canton.—ISHIKAWA, Prel. Cat., 1897, p. 30; Misaki, Boshu, Kii.

Chromis notatus JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 358; Tokyo; Proc. U. S. Nat. Mus., 1900, p. 755; Tsushima, Yokohama.

Head $3\frac{1}{2}$ in length; depth $2\frac{1}{10}$; depth of caudal peduncle 7; eye $3\frac{1}{2}$ in head; interorbital space $3\frac{1}{2}$; snout $3\frac{1}{2}$; maxillary $3\frac{3}{8}$; D. XIII, 12; A. II, 10; scales in lateral series 25; between lateral line and insertion of dorsal 3; between lateral line and insertion of anal 10.

Body ovate, the contour somewhat arched anterior to dorsal fin, a slight elevation over eye, the ventral outline less curved than the dorsal. Interorbital space convex; preorbital narrow, its width contained $3\frac{1}{2}$ times in the orbit. Mouth very oblique, the maxillary extending to a vertical between anterior edge of orbit and pupil. Teeth in narrow bands on anterior part of jaws, the bands narrowing to a single row of close-set teeth posteriorly, the outer series somewhat enlarged and curved. Pseudobranchiæ prominent. Gill rakers on first arch 10+20, slender, compressed and close set. Edges of preopercle and opercle entire.

Head and body completely covered with large, weakly ctenoid scales; rather elongate, minute scales extending far out on the membranes of dorsal, anal, and caudal fins. Lateral line incomplete, ending below insertion of soft dorsal. Fourth to fifth or sixth dorsal spine longest, $1\frac{1}{2}$ in head; middle rays of soft dorsal longest, filamentous,

extending, when depressed, to middle of caudal. Second anal spine strong, equal in length to longest dorsal spine. Longest anal rays extending a little beyond base of caudal; 2 or 3 sharp spines on upper and lower edge of base of caudal, the fin deeply notched, the upper and lower lobes somewhat filamentous, the length contained 3 times in head and body. Upper rays of pectoral longest, gradually becoming shorter to the lowest. Ventrals pointed, the outer ray longest, filamentous.

Color in spirits, brownish, the color becoming more intense on upper parts, especially along base of dorsal fin and also near base of anal; silvery on breast and lower part of head; axil blackish, the color extending over the upper part of base of pectoral, forming a conspicuous dark blotch; inconspicuous, narrow, dark lines, one on each row of scales, extending along sides of body; dorsal and anal blackish toward the tips, the basal part and the last 2 or 3 rays yellowish white; middle rays of caudal and the upper and lower edge of the fin light, the other parts dark brownish; pectorals and ventrals dusky. In a small, highly colored example the under parts are strongly suffused with orange, the bases of dorsal and anal; the last 2 rays of the same fins, the middle rays of the caudal, and its upper and lower edge are bright orange.

In life the ground color is steel-violet.

This little fish is very abundant throughout southern Japan in the bays and about rocks. It is used as food, though from its small size held in low esteem, as the name *Dogoro* indicates. Our specimens are from Tokyo, Misaki, Enoshima, Onomichi, Kobe, Wakanoura, Hiroshima, Tsushima, and Nagasaki.

(*notatus*, spotted.)

3. POMACENTRUS Lacépède.

Pomacentrus LACÉPÈDE, Hist. Nat. Poiss., IV, 1803, p. 508 (*paro*); (teeth biserial, soft dorsal short, often elevated; caudal deeply forked, teeth truncate).

Pristotis RÜPPEL, Neue Wirbelthiere Fische, 1837, p. 128 (*cyanostigma*) (= *Pomacentrus*).

Pseudopomacentrus BLEEKER, Verh. Holl. Maats. Weten., II, 1877, p. 40 (*littoralis*); (teeth rounded; preorbital notched; caudal lunate).

Parapomacentrus BLEEKER, Nat. Verh. Holl. Maats. Weten., II, 1877, p. 65 (*polynema*); (teeth uniserial; lower jaw scaly; snout scaly; spinous dorsal with membrane incised and lobed).

Amblypomacentrus BLEEKER, Nat. Verh. Holl. Maats. Weten., II, 1877, p. 68 (*breviceps*); (snout and lower jaw naked).

Eupomacentrus BLEEKER, Nat. Verh. Holl. Maats. Weten., II, 1877, p. 73 (*lividus*); (snout scaly; lower jaw naked; membranes of spinous dorsal not notched; teeth uniserial).

Brachypomacentrus BLEEKER, Nat. Verh. Holl. Maats. Weten., 1877, p. 73 (*albifasciatus*); (as above; membrane of spinous dorsal deeply notched).

Body ovate, or oblong, compressed, the profile steep, usually rounded. Head moderate, nearly as deep as long, the snout scaly,

the lower jaw scaly or naked. Mouth quite small, terminal, the jaws equal; each jaw armed with one or two close-set series of compressed, immovable teeth, which are truncate or rounded at tip, sometimes a few small teeth behind these. Gill rakers long; preopercle more or less serrate; preorbital serrate. Scales large, strongly ctenoid, the lateral line running parallel with the back to near the end of the dorsal fin, at which point it ceases. Dorsal fin continuous, with 12 or 13 low stout spines; membrane of spinous dorsal, usually not deeply incised nor lobed, the soft part more or less elevated, its last rays gradually shortened; lower limb of preopercle usually more or less scaly; preorbital narrow, without deep notch; anal fin similar to soft dorsal, with 2 spines, of which the second is much the larger; soft rays 12 to 16; dorsal spines with a sheath of large scales, the membranes of both dorsal and anal covered high up with small scales; caudal fin more or less forked, the lobes rounded; lower pharyngeals triangular; branchiostegals 5 or 6. Species numerous in the tropical seas; extremely variable in form and color, the brilliant coloration apparently dependent on surroundings.

(*πῶμα*, opercle; *κέντρον*, spine.)

- a. Body rather elongate, the depth less than half the length to base of caudal; caudal fin deeply forked, with filamentous tips; preorbital and lower jaw naked.
 b. Dorsal rays XIII, 11; anal II, 11; scales 27; a dark spot above gill opening
 *violascens*, 4.
 bb. Dorsal rays XIII, 14; anal II, 14; scales 25; color largely deep blue. *caelestis*, 5.
 aa. Body rather deep, about half length in adult; caudal fin slightly concave, the lobes rounded; preorbital and jaws naked; dorsal rays XIII, 15; anal II, 15; scales 25; young with a large ocellus edged before with white, on the soft dorsal..... *tripunctatus*, 6.

4. POMACENTRUS VIOLASCENS Bleeker.

Pristotis violascens BLEEKER, Journ. Ind. Arch., II, 1848, p. 637; Sumbawa.

Pomacentrus violascens BLEEKER, Natuurk. Tyd. Ned. Ind., VI, p. 318; XII, p. 222.—GÜNTHER, Cat. Fish., IV, 1862, p. 20; Sumbawa, Nias.—BLEEKER, Holl.

Maatsch. Vet., 1877, p. 46; Nias, Sumbawa, Flores, Buro, Amboyna, Ceram.

Dascyllus xanthurus BLEEKER, Amboyna, III, 1853, p. 117; Nias.

Pomacentrus tenuis KAROLI, Prodr. Pisc. As. Or., 1882, p. 27; Hirado. (No description; probably not of Bleeker, whose species, from Amboyna, has the caudal lobes dark.)

Pomacentrus rathbuni JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 754; near Yokohama.

Head $3\frac{1}{2}$ in length; depth $2\frac{3}{4}$; depth of caudal peduncle $6\frac{1}{2}$; eye $2\frac{3}{4}$ in head; snout 4; interorbital space 3; maxillary 3; dorsal XIII, 11; anal II, 11; scales in lateral line 27; between lateral line and insertion of dorsal 3; between lateral line and insertion of anal 9.

Eye large, somewhat oblong; interorbital space convex; its width equal to vertical diameter of eye. Snout short, rounded. Jaws subequal; cleft of mouth oblique; maxillary extending posteriorly to edge

of orbit; its length equal to width of interorbital space. Teeth in a single row; firmly embedded; 42 in upper jaw, 34 in the lower; incisor-like; broad anteriorly, the cutting edge scarcely rounded; narrower and gradually becoming pointed posteriorly. Gill rakers on first arch 21; long, slender, with minute bristles on the sides. Preorbital narrow, its edge not notched. Edge of suborbital serrated; not adnate to cheek. Posterior edge of preopercle finely serrated; the lower edge entire. Opercle with a rather large flat spine, above which are two closely opposed smaller ones. Scales ctenoid. Head with scales everywhere except on preorbital, symphysis of lower jaw and branchiostegal region. Body completely scaled. Dorsal and anal fins with a low sheath of scales along their bases. Interradial membranes of dorsal, anal, caudal, and pectoral fins with thin, oblong scales. Lateral line interrupted in the region of the seventeenth vertical row of scales, beginning again on the third row below, where it is represented by a single pit in each scale. Dorsal spines growing longer consecutively to the fourth; others of about equal length; middle rays of dorsal filamentous. First anal spine about one-half as long as the second; the latter a little shorter than the rays; posterior rays filamentous. Caudal deeply forked; the longest upper and lower rays filamentous. Pectoral pointed, the upper rays longest. First (outer) ray of ventral filamentous. Color violaceous; no distinct color marks on alcoholic specimens, except a faint dark spot immediately above gill opening; a small light brown spot at upper edge of base of pectoral; edges of unpaired fins narrowly washed with brownish; a narrow, indistinct, light band along the center of each lateral row of scales.

This species is known to us from the types of *Pomacentrus rathbuni* from near Yokohama. Renewed comparison with Bleeker's plates and a larger experience with the variation of these fishes have convinced us of the identity of the Japanese specimens with Bleeker's *Pomacentrus violascens*. Bleeker's *cyanomos* and *teniurus* are certainly closely related. The species belongs to the typical group of *Pomacentrus*, characterized by the short soft dorsal and deeply forked caudal.

(*violascens*, becoming violet.)

5. POMACENTRUS CŒLESTIS Jordan and Starks.

Pomacentrus celestis JORDAN and STARKS, Proc. Cal. Ac. Sci., 1900, p. 383, pl. XXI; Wakanoura.

Head 3.5 in body; depth 2.8; eye 3.1 in head; maxillary 3.2; interorbital 4, equal to snout. Dorsal XIII, 14; anal II, 14; scales $2\frac{1}{2}$ -25-9.

Body regularly ovate-oblong, the anterior dorsal profile more convex than ventral. Interorbital space convex. Tip of snout on a level with lower margin of eye. Mouth small, slightly oblique, the jaws

about equal; maxillary reaching to below anterior edge of pupil; teeth in a single row in jaws, conical, rather blunt. Preorbital entire. Preopercle sharply denticulated.

Dorsal without a notch between the spinous and rayed portions. The rays and spines are evenly graduated from the first spine to the eighth or ninth soft ray. The last spine is about twice the length of the first, while the ninth ray is about three times. The rays thence rapidly shorten, leaving the longest rays projecting beyond the tip of the last ray a distance nearly equal to the latter's length, and reaching past base of caudal rays. Anal similar to dorsal and about of the same height; its base and tips of longest rays ending slightly anterior to those of dorsal. Pectoral shorter than head by about half the eye's diameter; its tip reaching to within a scale and a half above origin of anal. The first ray of ventral filamentous, its tip just reaching to anal. Lobes of caudal pointed, the upper lobe the longer.

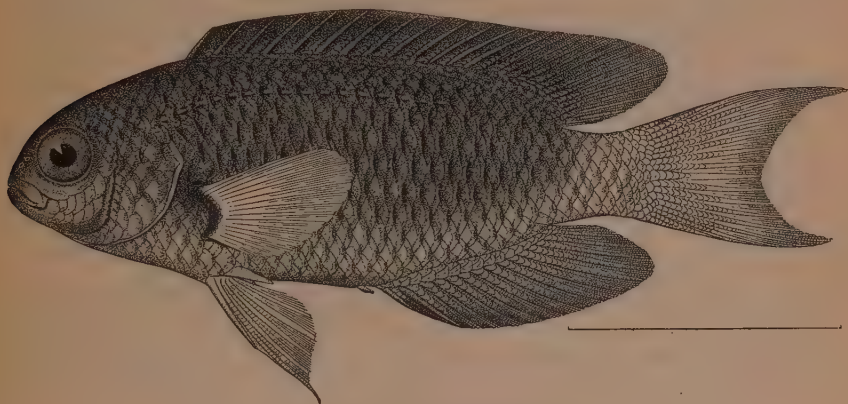


FIG. 1.—*POMACENTRUS CELESTIS*.

Snout, lower jaw, interorbital ring, and the edge of preopercle naked. Cheeks with two rows of scales. Scales on top of head extending forward to above anterior edge of pupil. A row of scales between each ray and spine of anal, dorsal, and caudal. Lateral line on sixteen scales, stopping under base of last dorsal spine.

Color in alcohol: back above lower edge of pectoral cobalt blue with a vertical dark line at the base of each scale, which extending under the transparent edge of each preceding scale shows through it, the color below fading into a purplish brown with a faint blue spot on each scale; dorsal and anal blackish, darker anteriorly; ventrals light, the outer edges dusky; pectorals and caudal yellowish, a black band across base of pectoral rays; edges of caudal and tips of rays dusky.

The single fine specimen on which this species is based was obtained by the writers at Wakanoura. The species is nearest *Pomacentrus melanochir* of Bleeker, having similar general form and coloration,

and the same absence of scales on the suborbital, mandible and snout. Bleeker's species (from Bali, Flores, Tinior, Buro, and Amboina) has three rows of scales on the cheek, and 28 instead of 25 scales in a lateral series. The coloration (dusky violet with rows of pearly spots) is somewhat different, but in both the dark curved bar at base of pectoral is conspicuous.

(*caelestis*, sky blue.)

6. POMACENTRUS TRIPUNCTATUS Cuvier and Valenciennes.

Pomacentrus tripunctatus CUVIER and VALENCIENNES, Hist. Nat. Poiss., V, 1830, p. 421; Vanicolo.

Pomacentrus vanicolensis CUVIER and VALENCIENNES, Hist. Nat. Poiss., V, p. 421; Vanicolo.

Pomacentrus emarginatus CUVIER and VALENCIENNES, Hist. Nat. Poiss., V, p. 422; Waigiou.

Pomacentrus chrysurus CUVIER and VALENCIENNES, Hist. Nat. Poiss., V, p. 423; South Seas.

Pomacentrus trilineatus (Ehrenberg) CUVIER and VALENCIENNES, Hist. Nat. Poiss., V, p. 428; Red Sea.—GÜNTHER, Cat. Fish., IV, 1862, p. 25; Massua, Molucca.—BLEEKER, Atl. Ichth., p. 406, pls. I to VI; Holl. Maats. Vet., 1877, p. 61; Sumatra, Java, Philippines, etc.—DAY, Fishes of India, I, 1886, p. 382.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1901, p. 753; Shimoda, type of *P. dorsalis*.

Pomacentrus biocellatus RÜPPELL, Neue Wirbelthiere Fische, 1837, p. 127, pl. xxxi, fig. 3; Red Sea.

Pomacentrus marginatus SCHLEGEL and MÜLLER, Amphiprion, p. 20.

Pristotis fuscus BLEEKER, Bali, p. 9, 1856; Bali.

Pomacentrus katunko BLEEKER, Timor, III, p. 169; Timor.

Pomacentrus bankanensis BLEEKER, Sumatra, p. 513; Banka.—GÜNTHER, Cat. Fish., IV, 1862, p. 26; China Sea.

Pomacentrus tenuimetopon BLEEKER, Amboyna, p. 283; Molucca.—GÜNTHER, Cat. Fish., IV, 1862, p. 25.

Pomacentrus sinsiang BLEEKER, Nat. Tyds. Ned. Ind., 1856, p. 90; Batavia.—GÜNTHER, Cat. Fish., IV, p. 22.

Pomacentrus dorsalis GILL, Proc. Ac. Nat. Sci. Phila., 1859, p. 147; Shimoda; coll. J. Morrow of Comm. Perry's Exped.—GÜNTHER, Cat. Fish., IV, 1862, p. 29; China.

Pomacentrus punctatolineatus CARTIER, Verh. Phys. Med. Ges. Würzburg, p. 98.

Of the type of *Pomacentrus dorsalis*, Gill gives the following account:

D. XIII, 15; A. II, 15. The body is oblong oval, with its abdominal outline more arched than its dorsal. The head is small, and its outline from the nape to the snout is straight. The eye is large and near the profile. The suborbital has a simple strong tooth directed horizontally backward, and separated by a semielliptical sinus from the body of the bone. The suborbital beneath the eye has also one or two small vertical processes. There are about 25 scales in a longitudinal row on the side. The color is brown, with 1 or 2 obscure bluish dots on each posterior scale of the sides. The operculum and preoperculum have a few more distinct ones, and there is also a distinct black dot at the scapular angle of the operculum. A large black dot, bordered anteriorly by bluish-white, is on the posterior rays of the dorsal. There is a black dot at the upper angle of the base of the pectoral. The ventrals are purple; the caudal yellow toward the base. (Gill.) Depth in adult about half length.

According to Bleeker, this species loses with age its black dorsal spot. Others have 3 black spots, and others 3 to 5 blue lines along the forehead; scales sometimes with blue dots; caudal and tail yellowish in adult.

This species is known to us only from the type of *Pomacentrus dorsalis* from Shimoda. This specimen, examined by us, corresponds very closely to Bleeker's figures of partly grown specimens of this widely diffused species, and we are obliged to accept the synonymy as given by him. The name *tripunctatus* is, however, prior to *trilineatus*.

(*tres*, three; *punctatus*, spotted, the young having sometimes three spots, one on the opercle, one on the soft dorsal, and one on the back of the tail.)

4. CHRYSIPTERA Swainson.

Chrysiptera SWAINSON, Nat. Hist. Fish., II, 1839 (*azureus*) (not *Chrysoptera* Latreille, 1825, a genus of *Lepidoptera*).

Paraglyphidodon BLEEKER, Holl. Maatsch. Wetens., 1877, p. 116 (*bonang*).

Glyphidodontops BLEEKER, Cat. Fish., p. 128 (*cyaneus* = *azureus*).

This genus differs from *Glyphisodon* in the presence of 2 rows of teeth in each jaw, these teeth being rounded at tip and not emarginate. It is divided by Bleeker into two genera, *Paraglyphidodon*, with the snout scaly and body rather deep, and *Glyphidodontops*, with the snout naked and the form oblong. The name *Chrysiptera* may be retained, as it differs a little from *Chrysoptera*.

(*χρυσός*, golden; *περὶον*, fin.)

- a. Adult uniform violet black; dorsal rays XIII, 14; anal, II, 13.....*melas*, 7.
 aa. Adult brown; young with one or two black ocelli on the dorsal; dorsal rays XIII, 65; anal, II, 13.....*bonang*, 8.

7. CHRYSIPTERA MELAS (Kuhl and Van Hasselt.)

Glyphisodon melas (Kuhl and Van Hasselt) CUVIER and VALENCIENNES, Hist. Poiss., V, 1830, p. 472; Java.—SCHLEGEL and MÜLLER, Amphiprion, p. 23, pl. v, fig. 2.—GÜNTHER, Cat. Fish., IV, 1862, p. 45.—BLEEKER, Atlas Ichth. Pom., pl. ccciv, fig. 4.—KLUNZINGER, Fisch. Rothen Meeres, p. 526.—BLEEKER, Holl. Maat. Vet., 1877, p. 124; Nias, Singapore, Java, Celebes, Solor, Ceram, Amboyna.

Glyphisodon ater (Ehrenberg) CUVIER and VALENCIENNES, Hist. Poiss., V, p. 473; Massuah, Red Sea.

Glyphisodon violaceus BREVOORT, Exped. Japan, 1856, p. 264; Riukiu Islands (Okinawa) (uniform dusky violet.)

“D. XIII, 14; A. II, 13; scales in lateral series 28; in transverse series 3 ± 10 .

“The height of the body is more than one-half of the total length, the caudal fin not included; the infraorbital ring below the orbit is not much narrower than the preorbital. Teeth very narrow, scarcely compressed. Dorsal spines rather short; caudal fin subtruncated. Uniform black, shining greenish.” (Günther.)

This species is placed in the list of Japanese fishes because the description of *Glyphidodon violaceus* from Riukiu apparently refers to it. But there is room for doubt as to the accuracy of this identification.

We have 3 or 4 very young specimens from Misaki, olivaceous in life, with two narrow cross-bands of bright yellow, the caudal yellow; no ocelli. They may belong to this or some related species.

Still another species with a bright yellow caudal fin occurs in the tide pools at Misaki. Having no specimen more than an inch long we can not identify this.

(μῆλας, black.)

8. CHRYSIPTERA BONANG (Bleeker).

Glyphidodon bonang BLEEKER, Sumatra, p. 582; Sumatra.—GÜNTHER, Cat. Fish., IV, p. 45.

Paraglyphidodon bonang BLEEKER, Holl. Maats. Vet., 1877, p. 118; Sumatra, Java.

“D. XIII, 15 to 16; A. II, 13; scales in lateral series 29; in traverse series 4 + 11.

“The height of the body is contained $1\frac{1}{2}$ times in the total length, without caudal; infraorbitals scaly; caudal fin slightly emarginate, with the lobes rounded. Mature specimens uniform brown, the dorsal, anal, and ventral fins being blackish toward the margin; a black spot superiorly at the base of the pectoral fin. Immature specimens with lighter dots, and with a large dark ocellus edged with whitish on the base of the posterior portion of the soft dorsal fin.” (Günther.)

A little fish from Misaki, less than an inch long, with a large ocellus on the spinous dorsal, and a smaller black spot in the axil of the soft dorsal, can be referred to no other known species. It has the dorsal rays XIII, 16, the anal II, 13, the depth half the length, and the body with two pale cross shades.

In coloration it corresponds to the “*zonatus*” form of *Chrysiptera brownriggi* (Bennett) (*Glyphidodon antjerius* Cuvier and Valenciennes), but in form of body and number of dorsal rays it differs widely from that species.

(*bonang*, the vernacular name in Sumatra.)

9. GLYPHISODON Lacépède.

*Abudefduf*¹ FORSKÅL, Descr. Anim., etc., 1775, p. 59 (*sordidus*) vernacular name, not intended for use in taxonomy.

Glyphisodon LACÉPÈDE, Hist. Nat Poiss., IV, 1803, p. 542 (*moucharra*).

Segastes JENYNS, Voy. Beagle, 1842, p. 63 (*imbricatus*) (dorsal spines 12; snout scaly).

¹ The writers have hitherto adopted for this genus the earlier name, *Abudefduf*, given by Forskål. Forskål divides the Linnæan genus *Chatodon* into three subdivisions, corresponding to the modern families of Chatodontidæ, Pomacentridæ, and Acanthuridæ. To these he applies the names of *Chatodon*, *Abudefduf*, and *Acanthurus*. The paper of Forskål, printed after his death, is one of the ablest ichthyological

Euschistodus GILL, Proc. Acad. Nat. Sci. Phila., 1862, p. 145 (*declivifrons*).

Hemiglyphidodon BLEEKER, Holl. Maatsch. Wetens., 1877, p. 91 (*plagiometopon*) (lower pharyngeals quadrate).

Amblyglyphidodon BLEEKER, Holl. Maatsch. Wetens., 1877, p. 92 (*aureus*) (scales above lateral lines in 1 or 2 rows).

Glyphidodon corrected spelling.

Body deep, compressed, covered with large ctenoid scales; snout without scales; preopercle and preorbital entire, the lower limb of preopercle scaleless; 3 to 4 rows of scales between lateral line and dorsal; teeth compressed, fixed, more or less distinctly emarginate, in one series in each jaw, those below occupying most of the free edge of the jaw; jaws subequal. Dorsal usually with 13 spines, the last slightly shorter than the median ones; branchiostegals 5 or 6; pyloric

works of the last century. An inspection of the work makes it likely that considerable confusion occurred in the arrangement of his notes for publication. It is not likely that he intended to have *Abudefduf* used as a generic name. It was apparently an Arabic word placed in his notes as a stop-gap until a classic word should be chosen, as was done in the case of *Acanthurus*. If the case of *Abudefduf* stood alone, we might feel compelled to use the name as that of a modern genus. But there are a number of similar cases in Forskål's work, among which it will be difficult to draw the line. For example, he states that the very vast genus *Sciæna* will also admit of convenient subdivision, and a number of groups under Arabic names are more or less fully defined, the type species in each case being evident. Some of these, as *Nagua* and *Harid*, are plainly not available, but for others, as *Djabub* and *Abudefduf*, something of an argument can be made. In our judgment, all these group names may be rejected as of merely vernacular, not binomial, character. In almost every case the name of Forskål (1775) has priority over its modern equivalent.

The names concerned are the following:

Forskål's group name.	Page.	Type.	Equivalent.
<i>Nagua</i>	xvii	<i>gibba?</i>	<i>Genyoroqe</i> .
<i>Louti</i>	44	<i>louti</i>	<i>Variola</i> .
<i>Daba</i>	44	<i>areolatus</i>	<i>Epinephelus</i> .
<i>Abudjubbe</i>	44	<i>lunulatus</i>	<i>Cheilinus</i> .
<i>Harid</i>	44	<i>harid</i>	<i>Scarus</i> .
<i>Abuhamrur</i>	44	<i>hamrur</i>	<i>Priacanthus</i> .
<i>Hobar</i>	44	<i>fulvifamma</i>	<i>Lutjanus</i> .
<i>Farer</i>	44	<i>sammara</i>	<i>Holocentrus</i> .
<i>Ghanan</i>	44	<i>ghanam</i>	<i>Scolopsis</i> .
<i>Djabub</i>	44	<i>yarbua</i>	<i>Therapon</i> .
<i>Gaterin</i>	45	<i>gaterina</i>	<i>Plectorhynchus</i> .
<i>Schoür</i>	45	<i>mahsena</i>	<i>Lethrinus</i> .
<i>Tahhmel</i>	45	<i>tahmel</i>	<i>Opisthistius</i> .
<i>Abudefduf</i>	59	<i>sordidus</i>	<i>Glyphisodon</i> .

Of these names, *Nagua* is especially dubious, as Forskål was uncertain as to its application. *Louti*, *Daba*, and *Abudjubbe* may be rejected on account of the peculiar form in which they are proposed, "*Perca dentibus Louti*," "perches having the teeth of *Perca louti*," being the designation of the subgeneric group. *Harid* is equivalent to the earlier *Scarus*. *Ghanan*, *Schoür*, and *Tahhmel* have no definition except that implied in the name, being the vernacular appellation of species defined further on. *Abuhamrur*, *Hobar*, *Farer*, *Djabub*, and *Gaterin* stand on a basis similar to that of *Abudefduf*. There is no injustice done in regarding all of these as of vernacular character, and in rejecting them all, as we reject "*Les Sphéroides*" and "*Les Pristipomes*" of French authors, when not placed in classical form or in binomial position.

cæca 3. Lower pharyngeals triangular. Species numerous; often brightly colored; about coral reefs in the tropical seas. We exclude from this genus all species with rounded, biserial teeth.

($\gamma\lambda\tilde{\upsilon}\phi\acute{\iota}\varsigma$, notch, of an arrow; $\acute{o}\delta\acute{o}\upsilon\varsigma$, tooth.)

- a. Axil of dorsal without black blotch or ocellus.
 - b. Body with 5 distinct black cross bands, the fourth under front of soft dorsal; depth $1\frac{3}{4}$ in length; dorsa. rays XIII, 13; anal II, 12; scales 26....*saxatilis*, 9.
 - bb. Body with 3 dark cross bands; depth about $1\frac{3}{4}$ in length; dorsal rays XIII, 13; anal II, 13; scales 27.....*curacao*, 10.
- aa. Axil of soft dorsal with a large black ocellus, persistent as a black blotch on caudal peduncle at all ages; body with about 5 narrow vertical silvery bands; depth $1\frac{3}{4}$ in length; dorsal rays XIII, 16; anal II, 16; scales 28....*sordidus*, 11.

9. GLYPHISODON SAXATILIS (Linnæus).

OYABITSUCHIYA.¹

Chætodon saxatilis LINNÆUS, Syst. Nat., 10th ed., 1758, p. 276 (after *Chætodon cauda bifurca, fasciis 5, albis*, Mus. Adolph. Fred., I, p. 64); India.—FORSKÅL, Descr. Anim., 1775, p. 62; Red Sea, and of the earliest copyists; not *Glyphidodon saxatilis* of most writers, the name having been wrongly transferred to an American species, *Glyphisodon marginatus* (Bloch).

Glyphisodon saxatilis JORDAN and SNYDER, Fishes of Formosa MS.; Keerun, Formosa.

Chætodon rotundus LINNÆUS, Syst. Nat., 10th ed., I, 1758, p. 277 (after *Chætodon rotundatus cinereus fasciis 5*); India.

Labrus sexfasciatus LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 477; pl. XIX, fig. 2; Indian Ocean.

Abudefduf sexfasciatus JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 755; Shimoda, Misaki.

Chætodon tyrwhitti BENNETT, Fishes of Ceylon, 1833-1841, pl. XXV; Ceylon.—RICHARDSON, Ichth. China, 1846, p. 253; Canton.

Glyphisodon waigiensis QUOY and GAIMARD, Voy. Uranie Poiss., 1824, p. 391; Waigion, Rauwak.—CUVIER and VALENCIENNES, Hist. Nat. Poiss., V, 1830, p. 457 (fourth band under middle of soft dorsal, fifth on middle of caudal peduncle; body deep).

Glyphisodon rahti CUVIER and VALENCIENNES, Hist. Poiss., V, 1830, p. 456; IX, p. 507; Red Sea, Java, Celebes, New Guinea. (Caudal without dark shades.)

Glyphisodon celestinus CUVIER and VALENCIENNES, Hist. Nat. Poiss., V, 1830, p. 464; IX, p. 508; Ile de France, Malabar, Alietæ. (Caudal with a dark band along each lobe.)—RICHARDSON, Ichth. China, 1846, p. 253.—GILL, Proc. Ac. Nat. Sci. Phila., 1859, p. 147; Shimoda, Canton.—GÜNTHER, Cat. Fish., IV, 1862, p. 38; Hongkong, Pinang, China, Amboyna, India.—DAY, Fish. India, p. 386, pl. LXXXIII, fig. 2.—BLEEKER, Atlas Ichth. Pomac., p. 408, pl. IX, fig. 5.—BLEEKER, Holl. Maatsch. Wet., 1877, p. 101; Sumatra, Java, Singapore, Flores, New Guinea, Luzon, etc.—ISHIKAWA, Prel. Cat., 1897, p. 31; Riukiu.

Glyphidodon saxatilis var. *celestinus* GÜNTHER, Fische. Südsee, 1876, p. 229, pl. XXVI; Tahiti, etc.

Glyphisodon quadrifasciatus BLEEKER, Labr. Cten., p. 17.

Head $2\frac{9}{10}$ in length; depth $1\frac{3}{4}$; depth of the caudal peduncle $5\frac{1}{2}$; eye $2\frac{2}{3}$ in head; snout $3\frac{1}{2}$; interorbital space $2\frac{3}{4}$; D. XIII, 12; A. II, 12;

¹ Name of some person; its application not explained.

scales in lateral series 27; between lateral line and insertion of dorsal 4; between lateral line and insertion of anal 9.

Dorsal outline straight from snout to insertion of dorsal fin, considerably arched in some specimens; base of soft dorsal descending abruptly to caudal peduncle, ventral outline pretty evenly curved between snout and caudal peduncle; interorbital space broad, flat, or slightly convex. Snout blunt, shorter than diameter of eye, jaws equal, mouth almost vertical, the maxillary not reaching anterior edge of orbit. Teeth in a single row on each jaw, compressed and rather blunt. Pseudobranchiæ prominent; gill-rakers on first arch $8 + 17$, long and slender. Edges of preopercle and preorbital entire. Head and body covered with large ctenoid scales, the snout naked; small scales extending on bases of dorsal, anal, and caudal fins. Lateral line incomplete, ending below middle of soft dorsal. Fifth and sixth dorsal spines highest, contained $1\frac{5}{8}$ times in head; middle rays of soft dorsal highest, about equal to length of head. Second anal spine very strong, its length $1\frac{3}{8}$ in head; longest rays $1\frac{1}{2}$. Caudal deeply notched, the upper lobe longest, $2\frac{2}{5}$ in length of head and body. Pectorals 3 in length, rather falcate. Ventrals extending to insertion of anal, the first ray filamentous. Color, light olive, with a silvery reflection. Body with 5 distinct brownish black vertical bands, broad above, in the middle ones pointed below; the first band extends from occiput to origin of dorsal, ending below in a conspicuous dark spot at upper part of base of pectoral; the second band extends downward from bases of fourth to seventh spines and disappears before the belly is reached; the third has its origin at bases of tenth, eleventh, and twelfth spines and extends to origin of anal; the fourth extends between anterior part of soft dorsal and posterior part of anal; the fifth, not so distinct as the others, crosses the caudal peduncle. Head dusky, very dark on interorbital area. Membranes of spinous dorsal and basal part of soft dorsal dusky; the color of the dark bands extends upward on the fins; caudal dusky near the margin and at base; the other fins with a little dusky color.

Here described from a specimen 50 millimeters long from Misaki. An individual 185 millimeters long from Formosa measures as follows: Head $3\frac{1}{2}$ in length; depth 2; depth of caudal peduncle $1\frac{7}{8}$, $6\frac{1}{2}$; eye $3\frac{1}{8}$ in head; snout $3\frac{1}{2}$; interorbital space 3; D. XIII, 13; A. II, 12; scales 4-26-10.

This species, everywhere abundant throughout the Indian region, is common in the rock pools of Yogashima, Enoshima, and elsewhere about Misaki and Shimoda. Many young specimens were taken. Similar adult examples from Formosa have been examined. Among these we find none with the caudal lobes each marked with a dusky stripe as described in the form called *caelestinus*. For this reason we have hesitated to place *caelestinus* in the synonymy of *saxatilis*. It is probable, as Bleeker has noted, that this species, rather than the

American one, is the original *saxatilis* of Linnæus. The American species differs from the Asiatic one in the arrangement of its bands, the fourth being before the soft dorsal instead of under it. It should stand as *Glyphisodon marginatus* (Bloch). The Hawaiian species, *Glyphisodon abdominalis* (Cuvier and Valenciennes), is nearer the American species.

(*saxatilis*, pertaining to rocks).

10. GLYPHISODON CURAÇAO (Bloch).

Chætodon curaçao BLOCH, Ichthyol., p. 106, pl. CCXII, fig. 1; Curaçao, Caribbean Sea, by error.

Glyphisodon curassao CUVIER and VALENCIENNES, Hist. Nat. Poiss., V, 1830, p. 471.

Glyphidodon smaragdinus BREVOORT, Exped. Japan, 1856, p. 264, pl. VI, fig. 3; Riukiu (Okinawa).

Glyphidodon trifasciatus BLEEKER, Labr. Cten., p. 19; Amboyna, Ceram.—BLEEKER, Atlas Ichth. Pomac., pl. CCCCX, fig. 3.—GÜNTHER, Cat. Fish., IV, 1862, p. 42; Amboyna, Ceram.—BLEEKER, Holl. Maats. Vet., p. 105; Batu, Nias, Java, Celebes, Flores, Ternata, Ceram, Amboyna.

“D. XIII, 12 or 13; A. II, 13 or 14; scales in lateral line 27; in transverse series 3+10.

“The height of the body is three-fifths of the total length (the caudal fin not included); the snout is nearly as long as the eye; the preorbital has a distinct notch above the maxillary, and its greatest width is one-half that of the orbit. Incisors short, small, trenchant. The seventh and eighth dorsal spines are longer than the twelfth, which is generally somewhat shorter than the last; the soft dorsal elevated; the caudal forked.

“Greenish-olive, with three black cross-bands, which are ill-defined and formed by black spots on the cutaneous sheaths of the transparent scales; the first from the first five or six dorsal spines to the pectoral, the second from the ninth and twelfth dorsal spines to the vent, and the third between the soft dorsal and the anal.” (Günther.)

This species is placed in the list of Japanese fishes on the basis of the figure of a specimen from Riukiu, published by Brevoort, and by him named *Glyphidodon smaragdinus*. The name *curaçao* must apparently be retained in spite of its erroneous geographical implication.

(*Curaçao*, Portuguese name of an island off the coast of Venezuela.)

11. GLYPHISODON SORDIDUS (Forskål).

Chætodon sordidus FORSKÅL, Descr. Anim., 1775, p. 62; Djidda, Red Sea.

Glyphidodon sordidus RÜPPELL, Atlas Reise Africa, Fische, 1828, p. 34, pl. VIII, fig. 1; Mohila, Red Sea.—CUVIER and VALENCIENNES, Poiss., V, 1830, p. 466; Macuer Island, Red Sea.—GÜNTHER, Cat. Fish., IV, 1862, p. 41; China, Mauritius, Red Sea.—KLUNZINGER, Fische Rothen Meeres, p. 525; Red Sea.—DAY, Fishes India, p. 385, pl. LXXXIII, fig. 1.—BLEEKER, Atlas Ichth. Pomac., p. 410, pl. XI, fig. 5; Holl. Maatsch. Vet., 1877, p. 96; Sumatra, Java, Cocos, Amboyna.—GÜNTHER, Fische der Südsee, II, 1876, p. 231; Tahiti, Raiatea, Samoa, Solomon Islands.—ISHIKAWA, Prel. Cat., 1897, p. 31; Riukiu,

Glyphisodon sordidus JORDAN and SNYDER, Fishes of Formosa Ms.; Kotosho, Formosa.

Glyphisodon gigas LIÉNARD, Dix, Rapp. Hist. Nat. Maur., p. 35; Mauritius.

Glyphidodon notatus DAY, Proc. Zool. Soc. Lond., 1869, p. 521; young.

Head $2\frac{3}{4}$ in length; depth $1\frac{1}{4}$; depth of caudal peduncle 5; eye 3 in head; snout $3\frac{1}{2}$; interorbital space 3; D. XIII, 16; A. II, 16; scales in lateral series 28; between lateral line and insertion of dorsal 4; between lateral line and insertion of anal 12. Body deep, greatly compressed, the caudal peduncle short; dorsal outline elevated, the highest point at, or a little posterior to, insertion of dorsal, the ventral contour more evenly rounded than the dorsal. Interorbital area convex. Snout short, the jaws equal, the maxillary extending to a point below anterior edge of orbit. Teeth in a single row, close set, compressed, the cutting edges finely serrated, brownish at the tips. Pseudo-branchiæ large; gill rakers on first arch $5 + 15$, long and slender. Edges of suborbital and preopercle entire. Head and body covered with large weakly ctenoid scales, the snout naked, bases of fins with a sheath of scales, minute scales extending far out on membranes of fins. Lateral line incomplete, ending below middle of soft dorsal. Middle spines of dorsal highest, 2 in head; middle rays of dorsal and anal highest, $1\frac{3}{4}$ in head. Caudal notched, the lobes equal. Ventrals reaching a little beyond insertion of anal, the first ray filamentous. Pectorals rounded, $1\frac{1}{2}$ in head.

Color, dark brown, becoming silvery toward the ventral parts; 5 narrow vertical silvery bands crossing the body, the first extending from insertion of dorsal to axil of pectoral fin, the second passing downward from base of sixth spine, the third from base of ninth spine, the fourth from base of first ray, the fifth from middle of soft dorsal to posterior part of anal; a large dark blotch near middle of spinous dorsal, a black spot as large as pupil on upper part of base of pectoral, a conspicuous black spot as large as orbit on body below posterior part of base of soft dorsal. Each scale has a broad, dark, posterior border. In some specimens the second light band is absent, the dark parts uniting in a broad dark band, which extends upward on the spinous dorsal.

The above description is of specimens about 45 millimeters long, from Misaki.

A specimen about 200 millimeters long, from Honolulu, Hawaiian Islands, shows the following characters: head $3\frac{1}{2}$ in length; depth $1\frac{3}{8}$; depth of caudal peduncle $5\frac{1}{2}$; eye $4\frac{1}{2}$ in head; interorbital space $2\frac{1}{2}$; snout $2\frac{3}{4}$; D. XIII, 15; A. II, 15; scales 4–26–12. The maxillary does not extend to the orbit, reaching only to a point below the nostril. The denticulations on the cutting edges of the teeth can scarcely be recognized. The width of the suborbital is contained 2 times in the orbit.

This species, common throughout India and Polynesia, is known in

Japan from numerous young examples taken by us in the rock pools of Misaki and the neighboring points of Yogashima and Enoshima. These specimens agree with others from Formosa and Hawaii. The large black blotch behind the soft dorsal is always present.

(*sordidus*, mean-looking.)

Family II. LABRIDÆ.

THE WRASSE-FISHES. ~ . .

Body oblong or elongate, covered with cycloid scales; lateral line well developed, continuous or interrupted, often angularly bent. Mouth moderate, terminal; premaxillaries protractile; maxillaries without supplemental bone, slipping under membranaceous edge of the preorbital; anterior teeth in the jaws usually very strong and canine-like; teeth of the jaws separate or soldered together at base, not forming a continuous plate; no teeth on vomer or palatines; lower pharyngeals completely united into one bone, without median suture, this bone T-shaped or Y-shaped, its teeth conical or tubercular. Lips thick, longitudinally plicate. Nostrils round, with 2 openings on each side. Dorsal fin continuous, the spinous portion usually long, its spines rather slender, 3 to 20 in number, anal similar to soft dorsal, with 2 to 6 spines. Ventrals thoracic I, 5, inserted below the pectorals or slightly in advance of them. Branchiostegals 5 or 6; pseudobranchiæ well developed; gills $3\frac{1}{2}$, the slit behind the last arch small or obsolete; gill membranes somewhat connected, sometimes joined to the narrow isthmus. Air bladder present; no pyloric cæca. Species chiefly of the tropical seas, living among rocks, coral reefs, or kelp. Many of them are brilliantly colored, and some are valued as food fish. Most of them feed upon mollusks, the dentition being adapted for crushing shells.

- a. Dorsal spines 8 to 13 in number, anal spines 2 or 3; vertebrae less than 30 in number; species of tropical or subtropical seas.
- b. Lateral line continuous, bent abruptly posteriorly, but not interrupted.
- c. *Bodianinae*. Dorsal spines 12 or 13. Cheeks and opercles more or less scaly; preopercle usually with fine serrature.
- d. Dorsal rays XIII, 7; lateral teeth of jaws more or less confluent into a blunt edged bony ridge; preorbital very high; posterior canine tooth present; base of dorsal with a scaly sheath *Cherops*, 6.
- dd. Dorsal rays usually XII, 10.
- e. Posterior canine present; base of dorsal with a scaly sheath; soft dorsal and anal not falcate; scales in lateral line 30 to 40.
- f. Lateral teeth in jaws in one series; close set or confluent, forming a serrated edge *Lepidaplois*, 7.
- ff. Lateral teeth in jaws of two series, the inner close set or confluent, the outer conical and canine-like *Verreo*, 8.
- ee. Posterior canine wanting; base of dorsal and anal without scaly sheath; dorsal and anal not falcate; scales in lateral line 45 to 50.

Semicossyphus, 9.

- cc. *Thalassominae*. Dorsal spines 8 or 9.
- g. Preopercle serrate; cheeks and opercles with large scales; posterior canine present; dorsal fin with a scaly sheath; anterior dorsal spines elevated, filamentous in the males; scales large, about 20 in lateral line *Duymaria*, 10.
- gg. Preopercle entire.
- h. Opercles with large scales; cheeks with imbricate scales; lips moderate; base of dorsal without scaly sheath *Pseudolabrus*, 11.
- hh. Opercles scaleless, or with a few small scales only.
- i. Body oblong, not cylindrical, the depth more than one-fifth the length; opercles scaleless.
- j. Dorsal spines 9.
- k. Anterior canines prominent, turned forward with a cutting edge; no posterior canine. Scales moderate or large (20 to 50) *Anampses*, 12.
- kk. Anterior canines not turned forward to form a lateral cutting edge.
- l. Scales large, 25 to 30 in lateral line.
- m. Scales of breast as large as those of rest of body, or even larger; posterior canine normally present; canines of upper jaw very short, close set, forming a terminal cutting edge; lower teeth similar, but longer; mouth small; dorsal spines short, pungent *Stethojulis*, 13.
- mm. Scales on thoracic region not enlarged; anterior canines normal.
- n. Lips very thick, with folds, the lower pendant like chicken's wattles; cheeks with small scales below *Hemigymnus*, 14.
- nn. Lips not enlarged.
- o. Cheeks with two rows of small scales behind eye. *Güntheria*, 15.
- oo. Cheeks entirely scaleless; no sheath of scales at base of dorsal *Halichares*, 16.
- ll. Scales rather small, 50 to 80 in lateral line.
- p. Posterior canines obsolete *Coris*, 17.
- pp. Posterior canines present *Julis*, 18:
- ii. Body elongate, subcylindrical, covered with rather small scales; opercle with a row of small scales; no posterior canine. *Cheilio*, 19.
- jj. Dorsal spines 8; no scales on head; no posterior canine tooth; dorsal with a low sheath of scales; scales large.
- q. Snout short, not tubiform *Thalassoma*, 20.
- qq. Snout much produced, forming a tube, the jaws at its end *Gomphosus*, 21.
- bb. *Xyrichthyinae*. Lateral line interrupted behind, the anterior part following the line of the back, the posterior part median on caudal peduncle.
- r. Dorsal spines 11; preopercle serrate; cheeks and opercles with scales; no posterior canines *Cirrhilabrus*, 22.
- rr. Dorsal spines 9 (rarely 10); preopercle entire; no posterior canines.
- s. Cheeks and opercles covered with large scales; forehead not trenchant; lips full. *Cheilinus*, 23.

- ss. Cheeks scaleless or nearly so; opercles scaleless; anterior profile of head more or less convex.
- t. First two dorsal spines detached from the others, forming a separate fin on the occiput; anterior profile trenchant, its curve parabolic; no scales on head.

Iniistius, 24.

6. CHÆROPS Rüppell.

Chærops RÜPPELL, Verz. Mus. Senckenberg Fische, 1852, p. 20 (*meleagris* = *macrodon*).

Choironodon BLEEKER, Beitr. Gen. Topogr. Bat., about 1856, p. 513 (*macrodon*), name preoccupied.

Cossyphodes BLEEKER, Verh. Bat. Gen. Labr., XX, about 1861, p. 10 (*macrodon*).

Hypsigenys GÜNTHER, Ann. and Mag. Nat. Hist., 1861, VIII, p. 383 (*macrodon*).

Body compressed, oblong, covered with large scales; about 30 in the lateral line; snout obtuse; cheeks high, with very small scales which are generally not imbricate; operculum scaly; preopercle slightly serrate; forehead developing a fatty hump with age. Each jaw anteriorly with four strong canine teeth, the lateral teeth being more or less confluent into an obtuse osseous ridge; posterior canine present, at least in the adult. Dorsal rays XIII, 7; anal III, 9; soft fins not elevated; caudal subtruncate. Lateral line not interrupted.

Large fishes of the western Pacific, not crossing to Hawaii or to America.

(*χόιρος*, hog; *ὤψ*, appearance.)

- a. Scales about 24; body red, with blue spots on the scales and a broad oblique band of pink on the sides anteriorly *azurio*, 12.
- aa. Scales about 30; body with about 4 dark cross bands; a white band on back of caudal peduncle *anchorago*, 13.

12. CHÆROPS AZURIO Jordan and Snyder.

KANDAI (WINTER PERCH).

Labrus japonicus CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 99; Japan.

Coll. Langsdorff.—SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 163, pl. LXXXV; Nagasaki (not *Labrus japonicus* Houttuyn).

Cossyphus japonicus BLEEKER, Verh. Bat. Gen. Japan, 1852, pp. 16 and 114; Nagasaki.

Chærops japonicus GÜNTHER, Cat. Fish., IV, 1862, p. 96; China.—STEINDACHNER, Fische Japans., IV, 1887, p. 20; Tokyo, Nagasaki.—ISHIKAWA, Prel. Cat., 1893, p. 30; Misaki, Kagoshima, Ogosahara (Bonin Islands).—JORDAN and SNYDER, Check List, 1901, p. 86; Yokohama.

Chærops azurio JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1901, p. 747, after Schlegel, substitute for *japonicus* preoccupied.—JORDAN and SNYDER, Fishes of Formosa MS.; Formosa.

Head $3\frac{1}{5}$ in length; depth 3; depth of caudal peduncle 7; eye $4\frac{2}{3}$ in head; interorbital space 3; snout $2\frac{2}{5}$; D. XIII, 7; A. III, 10; scales in

lateral series 24; between lateral line and insertion of dorsal 3; between lateral line and insertion of anal 8.

Body rather elongate, compressed, the dorsal profile rising rapidly and evenly from snout to a point above posterior part of eye, where it rather abruptly bends backward and slightly upward to near middle of spinous dorsal, then downward to caudal peduncle, the greatest dorsal elevation being nearly attained at occiput; ventral contour evenly curved from chin to caudal peduncle. Snout long, the jaws equal; pre-orbital very broad, $1\frac{1}{2}$ times diameter of eye; interorbital area broad, notably convex; eye small, located midway between tip of snout and posterior edge of opercle. Teeth in 2 series; an inner row, which in the lower jaw has the teeth anteriorly coalesced into a narrow flat-edged ridge, laterally and posteriorly they are less closely united, making the ridge strongly serrated; in the upper jaw the inner ridge is unbroken laterally except by 2 rather strong canines in posterior part of jaw; an outer series, represented in the upper jaw by 4 strong canines, the middle ones much the larger; lower jaw with 4 canines of about equal size, embedded close together, the lateral ones curving outward. Pseudobranchiæ well developed, gill rakers on first arch 6+9, short, pointed. Posterior edge of preopercle very finely serrated; opercle with a soft flap slightly wider than diameter of pupil. Scales of body large, the dorsal and anal fins with a narrow sheath along the base; large scales extending over basal half of caudal; scales on opercle and subopercle large, on cheeks very small; preopercle with a broad naked edge. Lateral line continuous, bending rather abruptly to follow contour at base of soft dorsal fin. Posterior spines of dorsal highest, $2\frac{3}{4}$ in head, the edge of the fin notched, the membrane projecting above the spines; third anal spine strongest, its length contained 3 in head, the length of the first contained about twice in the third; rays of dorsal and anal of equal height, the longest or posterior ones $2\frac{1}{2}$ in head. Caudal truncate or slightly convex, its length $1\frac{1}{4}$ in head. Upper rays of pectoral longest, the others gradually shorter; the lower posterior edge of fin rounded. Ventrals extending to the anal opening.

Color in life, head and body pinkish brown; an oblique transverse band of dull olive green extending from axil of pectoral fin to bases of eighth and ninth dorsal spines, this followed by a broad band of clear pink, bordered posteriorly by an indistinct brownish band; scales on posterior part of body each with a vertical band of light clear blue; cheeks flesh color, lips blue, iris yellow, with blue lines above and below; dorsal and anal fins golden brown, with 2 blue stripes; caudal dull olive, with blue corners above and below; pectorals pink, the base golden; ventral spines clear blue, the rays golden. In spirits the bright colors disappear, leaving a broad pinkish yellow oblique band on body, bordered by darker color. The posterior scales each have a small bluish spot.

This large and handsome fish is generally common in the bays of Japan from Tokyo southward. We have specimens from Tokyo, Misaki, Wakanoura, Kobe, Hakata, Nagasaki, and Formosa.

(*azureus*, azure blue.)

13. *CHÆROPS ANCHORAGO* (Bloch).

Sparus anchorago BLOCH, Ichthyologia, V, p. 108, pl. cclxxvi, about 1785 (from a tank from Holiland).—SCHNEIDER, Syst. Ichth., 1801, p. 276; no locality.

Cossyphus anchorago TROSCHEL, Wiegmann's Archiv., 1840, p. 279.

Chærops anchorago GÜNTHER, Cat. Fish., IV, 1862, p. 95; Amboyna.—BLEEKER, Poissons du Japon, 1879, p. 5; Japan.

D. XIII, 7; A. III, 9; L. lat. 30. A posterior canine tooth, absent in young specimens. Preopercle serrated. Head nearly as high as long. Scales on preopercle small, numerous, imbricate. Body with 4 dark, broad cross-bands, the middle of which are sometimes confluent; a white cross-band on the back of tail, behind the dorsal; sides of the head with yellow dots; base of the pectoral brown; dorsal with two dark longitudinal lines; the other fins yellowish. (Günther.)

We have not seen this species, and record it on the identification of Dr. Ishikawa. Dr. Peters regards *Chærops macrodonta* Lacépède as a synonym of *Ch. anchorago*, but the reason for this view is not evident.

(*anchorago*, "anchor-tooth," an old name of the hook-jawed male salmon.)

7. *LEPIDAPLOIS* Gill.

*Lepidaplois*¹ GILL Proc. Ac. Nat. Sci. Phila., 1862, p. 140 (*axillaris*).

Body compressed, oblong, covered with large scales, 30 to 35 in the lateral line. Snout pointed; mouth large, the lateral teeth in both jaws in a single series coalescent at base; four canine teeth in front and a posterior canine tooth; cheeks and opercles with imbricated scales; dorsal and anal scaly at base; lateral line not interrupted; preopercle usually finely serrated; soft dorsal and anal not falcate anteriorly; caudal fin lunate. Dorsal rays usually XII, 10. Anal rays III, 12. Tropical parts of the western Pacific from Hawaii through Polynesia to Japan and Africa.

(λεπίς, scale; ἀπλοῖς, a simple cloak, in allusion to the scaly fins.)

- a. Color red, orange posteriorly, a large black axillary spot, a large black spot on spinous dorsal, one on spinous dorsal and one on anal; scales 26...*axillaris*, 15.
- aa. Color red, with many yellow spots anteriorly; a yellow cross bar on side of back, posterior parts dusky; scales 27.....*perditio*, 16.

¹ The genus *Diastodon* Bowdich, Excursion to Madeira, 1825, p. 238 (*speciosus* = *scrofa* Cuvier and Valenciennes, 1837) must be different from *Lepidaplois*, having much smaller scales (about 50). The form of the dorsal is not indicated.

14. LEPIDAPLOIS AXILLARIS (Bennett).

Labrus axillaris BENNETT, Proc. Comm. Zool. Soc., I, 1831, p. 166; New Hebrides.
Cossyphus axillaris CUVIER and VALENCIENNES, Hist. Nat. Poiss., XIII, 1837, p. 103, pl. CCCLXXI; Ile de France, Ulea.—GÜNTHER, Cat. Fish., IV, 1862, p. 103; Mauritius, Madagascar, Aneitum.—DAY, Fishes of India, 1885, p. 392 (with plate of *Cossyphus neilli*, apparently a different species having no dark spots).—GÜNTHER, Fische der Süd-See, II, p. 239; Red Sea, Mauritius, Madagascar, New Hebrides, Society Islands, Paumotu, Otaheite.

Head $3\frac{2}{3}$ in length; depth 3; depth of caudal peduncle $5\frac{1}{4}$; eye $4\frac{1}{2}$ in head; interorbital space $3\frac{1}{4}$; snout $2\frac{2}{3}$; D. XII, 10; A. III, 12; scales in lateral series 26; between lateral line and insertion of dorsal 4; between lateral line and insertion of anal 10.

Body elongate; caudal peduncle deep, compressed; head pointed; the snout long and sharp. Eye midway between tip of snout and border of opercle. Mouth large. Teeth in a single series, laterally coalesced at their bases, becoming entirely so anteriorly, where they are represented by flat plates; an outer series of 4 fangs on the tip of each jaw, the lateral ones of which are curved outward; 2 strong fangs projecting forward from the posterior part of each side of upper jaw. Pseudo-branchiæ large; gill-rakers on first arch 4+8, short, pointed. Posterior border of preopercle finely serrated. Scales extending as a basal sheath on dorsal, anal, and caudal fins; scales of cheek in 7 rows between eye and angle of preopercle; no naked space along edge of opercle; scales of head not elongate. Lateral line rather gently curved to follow contour of body below base of soft dorsal. Longest dorsal spine, $2\frac{1}{2}$ in head; longest ray, $1\frac{3}{4}$; third anal spine, $1\frac{1}{2}$; longest or first ray, $1\frac{3}{4}$. Caudal truncate, $1\frac{1}{2}$ in head; pectoral, $1\frac{2}{3}$; ventral, $1\frac{1}{2}$, not reaching anal opening.

Color, in alcohol, dull brownish olive, a large brownish black spot on base of pectoral, both before and behind, a similar spot on upper anterior part of spinous dorsal, on upper anterior part of soft dorsal, and in the same place on anal, the latter somewhat the larger; a trace of lemon yellow on soft dorsal and anal; ventrals with rows of small dark spots.

Color in life, according to Günther, brick-red on anterior third above the ventral surface, pink on the middle third, and orange posteriorly; the boundary between the red and pink oblique, between the pink and orange vertical; anterior ventral surface greenish; spinous dorsal pinkish, soft dorsal yellow, ventrals and anal greenish yellow, the former spotted with blue; the black spots as described above.

This species is known to us from a specimen 170 millimeters long, received from Nafa, Okinawa Island, in the Rukiu archipelago.

(*axillaris*, pertaining to the axil.)

15. LEPIDAPLOIS PERDITIO (Quoy and Gaimard).

Labrus perditio QUOY and GAIMARD, Voy. Astrolabe, 1834, p. 702, pl. xx, fig. 4;
 "obtained on dangerous reefs in the Pacific."

Cossyphus perditio CUVIER and VALENCIENNES, Hist. Nat. Poiss., XIII, 1837, p. 125
 (after Quoy and Gaimard).

Cossyphus atrolumbus CUVIER and VALENCIENNES, XIII, 1837, p. 123; Ile de
 France.—GÜNTHER, Cat. Fish., IV, 1862, p. 105; Mauritius, Minerva Reef,
 Saumarey Reefs, Aneitum.

Head $3\frac{1}{2}$ in length; depth $2\frac{1}{2}$; depth of caudal peduncle 6; eye $5\frac{1}{2}$
 in head; interorbital space $3\frac{1}{3}$; snout $2\frac{2}{3}$; D. XII, 10; A. III, 12;
 scales in lateral series 27; between lateral line and insertion of dorsal
 5; between lateral line and insertion of anal 13.

Body rather heavy and thick, the dorsal and ventral outlines pretty

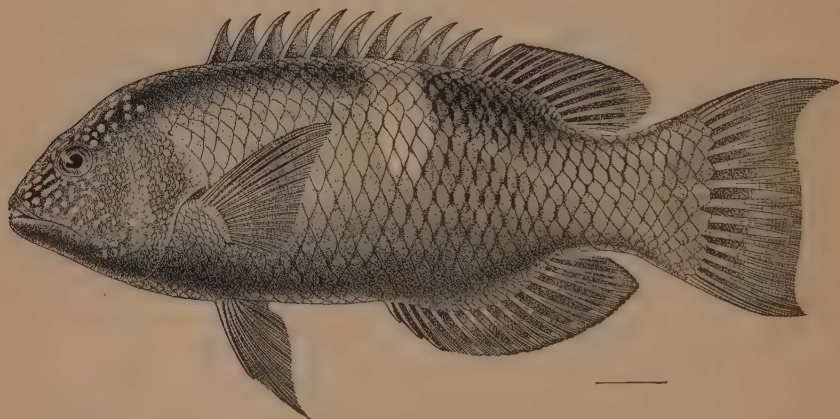


FIG. 2.—LEPIDAPLOIS PERDITIO.

evenly rounded except above occiput, where there is a slight elevation; head bluntly pointed. Jaws equal. Teeth in 2 series on anterior part of jaws, in a single series laterally; the inner series of upper jaw coalesced into a sharp, slightly serrated ridge; in the lower jaw the teeth are coalesced at the bases, the tips being quite prominent laterally; outer series represented by 4 strong canines of equal size in upper jaw; by 4, the inner 2 of which are small and close together, in the lower jaw. Edge of preopercle smooth or slightly serrated. Gill rakers on first arch 6+11, short, pointed; pseudobranchiae very large. Soft dorsal, anal, and caudal with a basal sheath of scales; interorbital space, snout and lower jaw naked, 9 series of scales on cheek, a narrow naked space along edge of preopercle. Membrane of dorsal incised almost to bases of spines, the membrane covering each spine thickened and projecting some distance beyond tip of spine; anterior spines longest, $4\frac{2}{3}$ in head, longest rays, $2\frac{1}{5}$, third anal spine 3. Caudal truncate, the uppermost and lowermost rays forming a falcate projection, the upper rays $1\frac{1}{5}$ in head. Ventral rays almost reaching first anal spine. Pectorals $1\frac{1}{4}$ in head.

In spirits the head is covered with small light spots; there is an elongate yellowish blotch on body above tip of pectoral, the scales on posterior half of body are edged with brownish black, the membrane of spinous dorsal is black anteriorly, the anal fin has a dark-band near its border.

Here described from a specimen 330 millimeters long from Wakanoura.

Color in life, bright copper red, occasionally greenish red, brighter in front, becoming suffused with dark orange, then with violet on the posterior parts; head freckled with yellow spots, iris red, chin and breast bright yellow, a yellowish white vertical band, bordered posteriorly by black, on body above tip of pectoral; spinous dorsal bluish black, soft dorsal golden, scarlet at base; anal golden, red at base, tipped with blackish; caudal bright yellow; pectoral pinkish with dark shades along the rays; ventral similar, though darker.

This species is known to us from four large examples beautifully colored, obtained by us from live boxes at Seikasaki, near Wakanoura, in Kii.

The species is doubtless identical with the one poorly described under the names of *perditio* and *atrolumbus*. The yellow cross-bar and the yellow spots on the head are very characteristic.

(*perditio*, loss; the fish was described and painted by Quoy during a storm and in imminent danger of shipwreck.)

8. VERREO Jordan and Snyder, new genus.

Verreo JORDAN and SNYDER, new genus (*oxycephalus*).

This genus differs from *Lepidaplois* in having the teeth in 2 series, the outer ones canine-like, growing smaller posteriorly, the inner ones coalesced into a narrow, blunt-edged plate; a large straight posterior canine projecting forward from hinder part of upper jaw. Large fishes, similar in appearance to *Lepidaplois*.

(*verres*, a young boar.)

16. VERREO OXYCEPHALUS (Bleeker).

KITSUNEDAI (FOX PERCH).

Cossyphus oxycephalus BLEEKER, Ichth. Notices, 1862, p. 7. (Specimen in Museum of Leyden, supposed to be from Japan.)—GÜNTHER, Cat. Fish., IV, 1862, p. 109; Australia.

? *Cossyphus unimaculatus* MACLEAY, Fishes of Australia, 1881, p. 77; Port Jackson. *Cossyphus unimaculatus* STEINDACHNER and DÖDERLEIN, Fische Japans, IV, 1887, p. 15; Tokyo.—ISHIKAWA, Prel. Cat., 1893, p. 30; Tokyo, perhaps not of Günther.

Diastodon unimaculatus JORDAN and SNYDER, Check List, 1901, p. 87; Yokohama.

Head $2\frac{3}{10}$ in length; depth $2\frac{1}{5}$; depth of caudal peduncle $7\frac{1}{2}$; eye $5\frac{1}{2}$ in head; interorbital space $4\frac{1}{4}$; snout $2\frac{3}{5}$; D. XII, 11; A. III, 12; scales in lateral series 34; between lateral line and insertion of dorsal 5; between lateral line and insertion of anal 12.

Snout long and sharp, preorbital broad, interorbital space slightly convex; eye large, midway between tip of snout and posterior edge of opercle. Outer series of teeth canine-like, larger anteriorly; a strong canine projecting forward from back part of upper jaw; inner series of teeth coalesced into a narrow blunt-edged plate. Pseudobranchiæ large; gill rakers on first arch 4+8, short, pointed. Preopercle finely serrated posteriorly. Dorsal with a sheath of scales posteriorly, anal and caudal with narrow sheaths; scales of head imbricate, those on occiput, cheeks, and on subopercle small, the latter elongate, those of opercle large; scales on cheek in about 7 series, counting downward from eye; snout, interorbital space, chin, and a space along edge of preopercle naked. Lateral line complete, evenly curved to caudal peduncle. Membrane of spinous dorsal deeply incised, the last spine longest, $2\frac{1}{2}$ in head, the seventh ray longest, $2\frac{1}{2}$ in head. Anal spines strong, the second heaviest, the third longest, $2\frac{2}{3}$ in head. Caudal

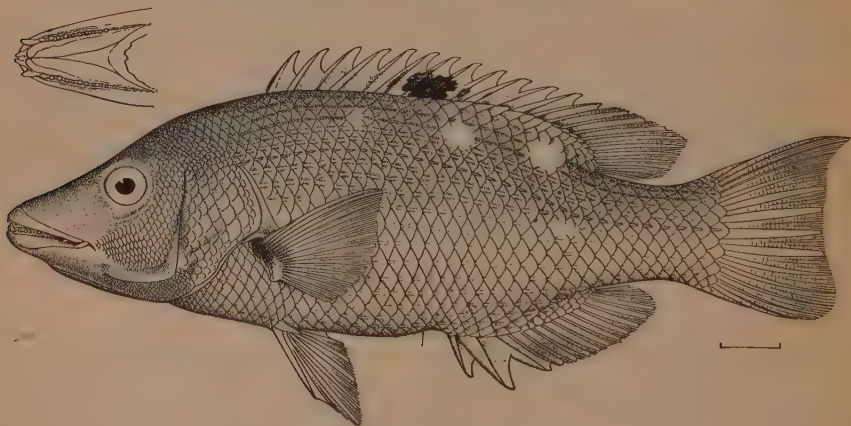


FIG. 3.—VERREO OXYCEPHALUS.

concave, the upper rays slightly longer than the lower, $1\frac{1}{2}$ in head. Ventrals not quite reaching anal opening. Pectorals $1\frac{3}{4}$ in head.

Color said to be red in life; a large black spot on dorsal in region of seventh, eighth, and ninth spines; posterior part of pectoral black, the dark color passing over to the upper side and extending downward along the base of the fin; each side with 3 or 4 white spots, perhaps pinkish in life; a small one under the fifth dorsal spine; a larger one under last dorsal spines; another large one under front of soft dorsal, and a smaller one below and behind it, below the lateral line.

This species is known in Japan from four specimens obtained in the markets of Tokyo, one by Dr. Döderlein, and the others by Professor Otaki. From specimens sent by Otaki to the Museum of Stanford University our description and figure are taken.

It is close to the *Verreo unimaculatus* Günther, the common "Pig-fish" of Australia, but it may differ in the presence of white spots

and possibly in the larger scales. If the two species are identical, as Günther has supposed, the name proposed by Bleeker, in an article quoted by Günther in the appendix to his own volume, is probably the earlier. At any rate, its type is Japanese.

(ὄζυς, sharp; κεφαλή, head.)

9. SEMICOSSYPHUS Günther.

Semicossyphus GÜNTHER, Ann. and Mag. Nat. Hist., VIII, 1861, p. 384 (*reticulatus*).

Body compressed, oblong, with rather small scales; about 50 in the lateral line; head longer than high. Scales on the cheeks and opercles; base of the vertical fins and limbs of the preoperculum not scaly; preopercle serrulate; lateral line not interrupted; 4 canine teeth in each jaw anteriorly; no posterior canine tooth; an obtuse osseous ridge round the edges of the jaw, without distinct lateral teeth. Adult specimens with a large hump of fat on the forehead. Dorsal rays XII, 10; Anal rays III, 12. Soft caudal, slightly concave. Species of large size found only along the coasts of Japan. From the Californian genus, *Pimelometopon*, *Semicossyphus* differs in the absence of the posterior canine tooth.

(*semi* = half; *Cossyphus*, a related genus, a synonym of *Bodianus* or *Harpe*.)

17. SEMICOSSYPHUS RETICULATUS¹ (Cuvier and Valenciennes).

KOBUDAI.

Cossyphus reticulatus CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1839, p. 139; Japan, Coll. Langsdorff.—RICHARDSON, Ichth. Chin., 1846, p. 255; Canton.—BLEEKER, Act. Soc. Sc. Indo-Nederl., VI, Japan, VI, p. 72; Nagasaki.

Labrus reticulatus SCHLEGEL, Fauna Japonica, Poissons, 1846, p. 161, pls. LXXXIII, LXXXIIIa, LXXXIV; Nagasaki.

Semicossyphus reticulatus GÜNTHER, Cat. Fish., IV, 1864, p. 99, after Schlegel.—STEINDACHNER and DÖDERLEIN, Fische Japana, IV, 1887, p. 14; Tokyo.—ISHIKAWA, Prel. Cat., 1893, p. 30; Tokyo.—JORDAN and SNYDER, Check List, p. 87; Tokyo.

Semicossyphus robecchii STEINDACHNER and DÖDERLEIN, Fische Japana, IV, 1887, p. 15; Yokohama, young.—JORDAN and SNYDER, Check List, 1901, p. 87; Yokohama.

Head 3 in length; depth 3; depth of caudal peduncle $6\frac{1}{2}$; eye 7 in head; interorbital space 3; snout $2\frac{1}{3}$; scales in lateral series 37; in series between lateral line and insertion of dorsal 7; between lateral line and insertion of anal 16. Dorsal rays XII, 10; Anal rays III, 12.

¹ *Labrus microlepidotus* Bloch, Ichthyologia, pl. CCXCII, 1785, from unknown locality = *Cossyphus microlepidotus* Cuvier and Valenciennes, XIII, p. 140, may be identical with *Semicossyphus reticulatus*, but seems rather more likely a true *Labrus*, as *Labrus merula*, having the dorsal rays XVII, 13, the anal III, 10, the fins small, and the coloration nearly uniform.

Body thick-set, elongate, the caudal peduncle deep; head with a hump, small on younger specimens, increasing greatly with age, on the anterior part of interorbital space. Snout sharp, jaws equal. Teeth in two series, those of the inner jaw coalesced to form a narrow sharp-edged ridge in each jaw, the ridge smooth in the upper jaw, strongly serrated in the lower; the outer row represented by 4 strong, fang-like teeth above and below, the inner ones of the upper jaw larger than the outer, the reverse being the case in the lower jaw. Pseudobranchiæ large; gill-rakers short, blunt, 6 + 10 on first arch. Posterior edge of preopercle very finely serrated. Scales not extending on bases of dorsal and anal fins; scales of head very small, 6 or 7 rows on cheek, the interorbital area, snout, chin, and a narrow space along edge of preopercle naked. Lateral line complete, evenly curved, there being no abrupt bend below base of soft dorsal. Dorsal spines low, the longest 3 in head, the membranes deeply incised, the thickened portion around each spine extending a short distance above point of spine; seventh ray

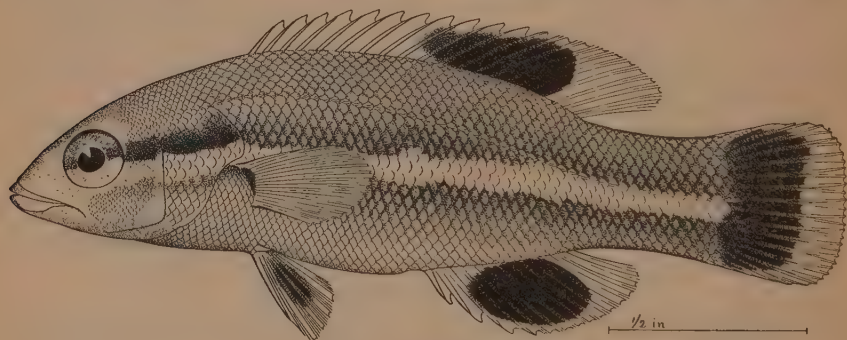


FIG. 4.—SEMICOSSYPHUS RETICULATUS (very young).

longest, about 2 in head. Second anal spine $5\frac{1}{2}$ in head, longest anal ray $2\frac{1}{4}$. Pectoral $1\frac{3}{8}$ in head; ventral $1\frac{3}{8}$, reaching but little over half way from its base to the vent.

In spirits the scales each have a dusky vertical band near the base which shows through the overlying scale; soft dorsal, anal and caudal mostly black; ventrals and axil of pectoral dusky; a narrow light band extends along the side of body. In life, crimson reddish, the young with a whitish or pink lateral stripe, the dark spots as above described.

The above description is of a specimen 250 millimeters long from Wakanoura.

With increasing age the black spots of the fins almost entirely disappear, the hump on the interorbital region assumes large proportions, in one specimen being about 300 millimeters above the skull, the lateral teeth of each jaw become more distinct and prominent, the serrations of the preopercle disappear, while the narrow pink lateral stripe

vanishes entirely. A specimen about 500 millimeters long from Tokyo shows the following characters: Head $3\frac{1}{8}$ in length; depth $2\frac{2}{16}$; depth of caudal peduncle $6\frac{1}{8}$; eye $7\frac{1}{2}$ in head; snout $2\frac{1}{8}$; interorbital space $2\frac{1}{2}$.

This species, which reaches a large size, is occasionally taken in the bays of southern Japan. We found it occasionally in the markets of Tokyo, and also at Misaki, Wakanoura, Onomichi, and Hakata. Specimens corresponding to the description of *Semicossyphus robecchii* were obtained at Tokyo and Onomichi. These have the soft dorsal and anal chiefly black, and a conspicuous whitish or rather pink stripe along the side. These are apparently the young of *S. reticulatus*, which becomes plain dull crimson with age. Still younger specimens have the pale lateral stripe and black fin spots still more distinct. We figure one of these from Wakanoura.

(*reticulatus*, netted.)

10. DUYMÆRIA Bleeker.

Duymæria BLEEKER, Act. Soc. Sci. Indo-Nederl., I, 1856, Amboyna, p. 52 (*aurigaria*).

Labrastrum GUICHENOT, Rev. Zool., 1860, p. 152, (*flagellifera*).

Body oblong, rather deep, compressed, covered with very large scales, 20 to 25 in the lateral line; lateral line continuous; cheeks and opercles with large imbricated scales; preopercle serrated. Teeth uniserial on sides of jaw; 4 strong canines in each jaw; posterior canines present; dorsal fin with a narrow scaly sheath; anterior dorsal spines rather high; sometimes filamentous; soft dorsal not falcate; caudal rounded. Dorsal rays, IX, 11. Anal rays, III, 9. Species of rather small size, brightly colored, the sexes unlike, East Indies, north to Japan.

(Named for A. J. Duymær van Twist, once governor of the Dutch East Indies.)

18. DUYMÆRIA FLAGELLIFERA (Cuvier and Valenciennes).

OHAGUROBERA (TOOTH-BLACK BERA)¹; GONBEKUSABI (RUSTIC WEDGE-FISH); MOROKO SHIBERA (CHINESE BERA).

Ctenolabrus flagellifer CUVIER and VALENCIENNES, Hist. Nat. Poiss., XIII, 1837, p. 240; no locality (male).—SCHLEGEL, Fauna Japonica Poiss., p. 166, pl. LCCCVI, fig. 2, 1846; Nagasaki.

Duymæria flagellifera BLEEKER, Act. Soc. Sci. Indo. Nederl., Amboyna, I, 1856, p. 53.—GÜNTHER, Cat. Fish., IV, 1862, p. 121 (after Schlegel).—ISHIKAWA, Prel. Cat., 1897, p. 29; Boshu, Tokyo.—JORDAN and SCHNEIDER, Fishes of Formosa, Ms.; Formosa.

Crenilabrus aurigarius RICHARDSON, Voyage of the Sulphur, Fishes, 1844, p. 90, pl. XLV, figs. 1, 2; Canton, male.

¹ The name *Bera* is applied by the Japanese to all Labroid fishes. Ohaguro, is the black ink-like dye used by peasant women in staining their teeth.

- Duymeria aurigaria* BLEEKER, Act. Soc. Sci. Indo. Nederl., I, Amboyna, 1865, p. 53.—GÜNTHER, Cat. Fish., IV, 1862, p. 121; Canton.—KAROLI, Prodr. Pisc. Asia, Orient, 1882, p. 28; Canton, Nagasaki.
- Crenilabrus rubellio* RICHARDSON, Voyage of the Sulphur, Fishes, 1844, p. 93, pl. XLV, fig. 3; Canton, younger male.
- ?? *Duymeria amboinensis* BLEEKER, Act. Soc. Sci. Indo. Nederl., I, 1856, Amboyna, p. 53; Amboyna (female); Atlas Ichth., p. 78, pl. XXIII, fig. 7; Amboyna.
- Crenilabrus spilogaster* BLEEKER, Japan, p. 416; Verh. Bat. Gens., XXVI, Nalez, Japan, 1852, p. 113, pl. VIII, fig. 2; Nagasaki, female.
- Duymeria spilogaster* BLEEKER, Act. Soc. Sci. Indo. Ned., Amboyna, I, 1856, p. 54.—GÜNTHER, Cat. Fish., IV, 1862, p. 122, after Bleeker.—KAROLI, Prodr. Pisc. Asia, Orient, 1882, p. 28; Yokohama.—ISHIKAWA, Prel. Cat., 1897, p. 29; Boshu, Sagami.
- Duymeria japonica* BLEEKER, Act. Soc. Sci. Indo. Ned., Amboyna, I, 1856, p. 53; Nagasaki, after Schlegel (male).—STEINDACHNER and DÖDERLEIN, Fische Japans, IV, 1887, p. 17; Tokyo.—JORDAN and SNYDER, Check List, 1801, p. 87; Yokohama.

Head $3\frac{1}{2}$ in length; depth $2\frac{1}{2}$; depth of caudal peduncle $6\frac{3}{8}$; eye $5\frac{1}{2}$ in head; snout $2\frac{1}{2}$; interorbital space $3\frac{1}{2}$. Dorsal rays IX, 11; Anal rays III, 9; scales in lateral series 22; between lateral line and insertion of dorsal 2; between lateral line and insertion of anal 6; scales on cheek in 2 rows.

Body rather short, compressed, elevated; a slight depression in contour above eye; head large, snout bluntly pointed, the jaws equal; interorbital area decidedly convex. Teeth in a single series laterally, a double series on anterior part of jaws; inner series with the teeth coalesced at base, the tips separate on sides of jaws; a canine in posterior part of upper jaw; outer series of 4 widely separated canines in each jaw, those above widely separated; below, closely apposed. Pseudobranchiae large; gill-rakers on first arch very short and stumpy. Preopercle finely serrated posteriorly, a small flap on the angle. Scales large; between lateral line and insertion of dorsal there is one large scale and a much smaller, triangular one; interorbital space, snout, chin, and a narrow area along edge of preopercle naked. Lateral line abruptly bent downward below base of dorsal fin; in some specimens rather evenly curved, or occasionally incomplete, and one or two scales below the soft dorsal without pores. Membrane of spinous dorsal not deeply incised between the spines, the thickened portion around each spine extending upward beyond the tip, forming in the male a long filament on the first and second spines, its height equal to length of head; the longest rays $1\frac{3}{4}$ in head. Second spine 4 in head, longest ray $1\frac{1}{2}$. Caudal rounded, $1\frac{1}{6}$ in head. Pectorals rounded, $1\frac{1}{8}$ in head. Ventrals extending to vent.

Described from a male specimen about 200 millimeters long, collected in Tokyo.

Color of male in alcohol, brownish, scales edged with light color; cheeks and opercles with narrow light-colored reticulations; dorsal

blackish with small spots and reticulations of greenish white; anal and caudal blackish; pectoral light. Female of a yellowish or brownish tint with a tinge of greenish, the scales with a light border, each scale of breast and belly with a small indigo-colored spot, a dash of the same color on the posterior part of opercle; dorsal, anal, and caudal greenish, mottled with dusky; ventrals tipped with dusky; anterior dorsal spines little produced, much lower than in the male.

This species is common throughout southern Japan in sandy bays, and is frequently seen in the markets. The male is very brightly colored in life, deep blue with markings of old gold, while the female has the dorsal fin lower, is paler, and is marked with indigo-blue spots. Ample dissections have shown that the nominal species *spilogaster* is the female of *flagellifera*, six male and four female specimens having been examined. Our specimens are from Tokyo, Misaki, Wakanoura, Kobe, Nagasaki, and Formosa.

(*flagellum*, whip; *fero*, to bear, from the produced dorsal spines of the male.)

11. PSEUDOLABRUS Bleeker.

Pseudolabrus BLEEKER, Proc. Zool. Soc. London, 1861, p. 413 (*rubiginosus=japonicus*).

Body compressed, oblong, covered with large scales, 25 to 30 in the lateral line; snout pointed; forehead without fatty hump; opercles scaly; cheeks with several rows of scales; dorsal fin not scaly at base; lateral line not interrupted; preopercle entire. Teeth in one series in the jaws; posterior canine present; lower pharyngeal teeth in more than one series. Fins low, the caudal subtruncate; fin rays D. IX, 10; A. III, 10. Size rather small.

Western Pacific, the species rather numerous.

The genus is not related to *Labrichthys (cyanotaenia)* with which genus it has been associated.

(*ψευδονης*, false; *Labrus*.)

- a. Scales on cheek in four rows; depth in adult about $2\frac{2}{3}$ in length; body reddish with several narrow olive-green stripes, most conspicuous on the head; male and sometimes female, also with two rows of pink spots below the dorsal; dorsal fin with black spots or blotches *japonicus*, 13.
- aa. Scales on cheek in three rows; body slender; depth in adult 4 in length; color olivaceous, reddish below; a small dark spot on caudal peduncle, no olive stripe nor pink spots *gracilis*, 20.

19. PSEUDOLABRUS JAPONICUS (Houttuyn).

SASANOHA (BAMBOO LEAF); BERA.

Labrus japonicus HOUTTUYN, Beschryvning Einige Japansche Visschen, 1782, p. 311 et seq.; Nagasaki (female), description incomplete.

Labrus rubiginosus SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 165, pl. LXXXVI, fig. 1; Nagasaki, male; not *Julis rubiginosus* RICHARDSON, 1843, also apparently a *Pseudolabrus*.

- Labrichthys rubiginosa* GÜNTHER, Cat. Fish., IV, 1862, p. 114; China, Japan.—STEINDACHNER and DÖDERLEIN, Fische Japans., IV, 1887, p. 16; Tokyo, Nagasaki.—ISHIKAWA, Prel. Cat., 1893, p. 30; Tokyo.
- Labrus eoithinus* RICHARDSON, Ichthyol. China, 1846, p. 255; Canton, male.
- Pseudolabrus eoithinus* JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 359, Tokyo.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 756; Tsushima.—JORDAN and SNYDER, Check List, 1901, p. 87, Yokohama.
- Labrichthys affinis* DÖDERLEIN, Ms.—STEINDACHNER, Fische Japans., IV, 1887, p. 16; Tokyo, female.

Head $3\frac{1}{3}$ in length; depth $2\frac{2}{5}$; depth of caudal peduncle $6\frac{1}{3}$; eye $5\frac{1}{2}$ in head; interorbital space 4; snout $2\frac{3}{5}$; D. IX, 10; A. III, 10; scales in lateral series 23; between lateral line and insertion of dorsal 3, the upper scale very small; between lateral line and insertion of anal 8; scales on cheek in 5 rows.

Body rather elongate, compressed; dorsal contour not elevated, evenly rounded. Head pointed, snout rather pointed, the jaws equal. Teeth in a single series on sides of jaws, distinct though close set; in 2 series anteriorly, the inner ones minute, the outer ones fang-like, curving backward; 1 or 2 fangs in posterior part of upper jaw. Pseudo-branchiæ not very large; gill-rakers on first arch 7+8, short, pointed. Posterior edge of preopercle smooth, the membrane projecting beyond the edge. Scales not extending far out on dorsal and anal fins, a very narrow sheath present; basal half of caudal with scales; interorbital space, snout, chin, and a narrow space along edge of preopercle naked. Lateral line complete, bending abruptly downward below base of soft dorsal. Edge of membrane of spinous dorsal notched, the membrane but little thickened around the spines; longest spine $4\frac{2}{3}$ in head, ray $2\frac{3}{5}$. Second anal spine $4\frac{1}{2}$ in head, the longest ray $2\frac{1}{2}$. Caudal truncate or slightly rounded, its length $1\frac{3}{5}$ in head. Ventrals and pectorals reaching an equal distance posteriorly, their tips as far before the vent as the insertion of the anal is behind it.

Color in spirits: Male, yellowish olive, 5 conspicuous, blackish, narrow, longitudinal stripes on upper part of body, the first just below base of dorsal, the second, third, and fourth radiating from eye, the fifth joined to the fourth just above pectoral; in very brightly colored specimens the third and fourth stripes are continued on the snout; between the stripes are small yellowish white spots, sharply defined from the first to the third stripes, indistinct or absent between the lower ones, the spots alternating with each other; a dark spot at upper edge of base of pectoral; snout and occiput dusky; dorsal with a black blotch somewhat larger than eye on the spinous part, sometimes followed by a second, less distinct spot, the membranes with dusky spots and reticulations; anal with 2 longitudinal dusky bands; caudal dusky; pectorals and ventrals plain. Female with narrow dark stripes on upper part of head, the lowest on a level with eye, a number of very indistinct orange-colored lateral stripes on body, 2 rows of small yellowish white alternating spots below base of dorsal, 2 short rows of

similar spots along sides of belly, a small spot at upper edge of base of pectoral; dorsal with 2 rows of sharply defined, very small black spots; other fins plain.

Color of male in life: Body and head greenish blue, cheeks and throat with reddish orange reticulations, lines of same color through eye; top of head and nape brownish; scales of upper parts with yellowish centers, the posterior ones tinged with red, broadly edged with greenish blue; upper part of body with 4 or 5 indefinite lateral stripes; dorsal greenish with reticulations of bright yellowish red; pectorals yellowish red, brightest on upper part of fin; anal greenish blue, with 3 wavy longitudinal lines of brick red; caudal edged with light orange.

This species is one of the commonest in the bays of southern Japan, abounding in all rocky places in shallow water, and frequently taken on the hook in the surf. It varies much in color from brilliant red to dull olive. The male has black blotches on the dorsal and about 5 streaks of dark olive on the body. The female has the dorsal with black dots, not blotches, and the streaks on the body are more or less obsolete. The pale spots along the sides of the back are almost always conspicuous in the male, but are often faint or absent in the female.

Our specimens are from Tokyo, Misaki, Enoshima, Wakanoura, Kobe, Hiroshima, Tsuruga, Hakota, Nagasaki, Tsushima and Totomi Bay where it was dredged in rather deep water.

20. PSEUDOLABRUS GRACILIS (Steindachner).

Labrichthys gracilis STEINDACHNER, Fische Japans, IV, 1887, p. 17; Tokio.

Pseudolabrus gracilis JORDAN and SNYDER, Check List, 1901, p. 87.

Head 4 in length; depth 4; depth of caudal peduncle $2\frac{1}{3}$; eye 5 in head; interorbital space $4\frac{2}{3}$; snout 3; D. IX, 11; A. III, 10; scales in lateral series 23; between lateral line and insertion of dorsal 1; between lateral line and insertion of anal 7; rows on cheek 3.

Body notably elongate; snout sharp; jaws equal; interorbital area low, convex; eye somewhat nearer to tip of snout than to posterior edge of opercle. Teeth in a single series laterally, coalesced or closely apposed at base, the points distinct; 1 or 2 strong canines projecting forward from posterior part of upper jaw; an outer row represented on anterior part of jaws by 2 canines above and 4 below. Posterior edge of preopercle not serrate, opercle with an elongate flap. Gill-rakers on first arch 7+10, short, pointed. Scales not forming a sheath on bases of dorsal and anal; basal half of caudal with scales; those on opercle large, imbricated. Lateral line complete, high on body, bent abruptly downward below base of soft dorsal. Dorsal low, the membrane scarcely incised, not thickened around the spines, a short, soft filament projecting beyond each spine, longest spine 3 in head, ray $2\frac{1}{16}$. Second anal spine $5\frac{1}{2}$ in head, longest ray $2\frac{1}{4}$. Caudal rounded, $1\frac{1}{2}$ in head, pectoral $1\frac{2}{5}$; ventral $1\frac{2}{5}$, the outer ray of the latter filamentous.

Color in spirits yellowish white, dusky above. the dusky color abruptly ceasing along the middle of the third row of scales below the dorsal fin; a dusky band bordered by blackish extending from tip of snout through eye and on head; it can be indistinctly traced to the upper part of caudal peduncle, where it ends in a small dark blotch.

Described from a specimen 140 mm. long from Nagasaki.

This well-marked species is distinguished by its slender body and by the presence of but 3 rows of scales on the cheek. It seems to be rare. We have but 2 specimens from Nagasaki and Misaki.

(*gracilis*, slender.)

12. ANAMPSES Cuvier.

Anampses CUVIER, Règne Anim., 2d ed, 1829. (*tetrodon*; *cuvieri*, the characters taken from the latter species; the former perhaps a *Tilapia*).

Amphices JORDAN and SNYDER, new subgenus (*geographicus*).

Body oblong, rather deep, compressed, covered with moderate or large scales (25 to 30 in the lateral line, about 50 in subgenus *Amphices*); lateral line continuous; head scaleless; preopercle entire; teeth uniserial; two anterior canines in each jaw prominent, turned forward, compressed, with cutting edges; no posterior canines; fin rays D. IX. 12; A. III, 12. Species of rather large size and showy colors, of the East Indies and Polynesia. The group is naturally divisible into two groups distinguished by the size of the scales. The Japanese species constitutes the new subgenus or probably distinct genus *Amphices*,¹ distinguished from *Anampses* by the small scales.

(*Ἀνάμψης*, probably an old name, its meaning not explained.)

21. ANAMPSES GEOGRAPHICUS Cuvier and Valenciennes.

Anampses geographicus CUVIER and VALENCIENNES, Hist. Nat. Poiss., 1510, XIV, 1839, p. 10, pl. CCCLXXXIX; Amboyna.—BLEEKER, Atlas Ichth., 1862, p. 102, pl. xxv, fig. 3; Amboyna, Ceram.—GÜNTHER, Cat. Fish., IV, 1862, p. 137; Amboyna.—ISHIKAWA, Prel. Cat., 1897, p. 29; Riukiu Islands.

Dorsal rays IX. 12; anal rays III, 12; scales in lateral line 50; in transverse series 8+22.

Dorsal spines stiff. Brownish violet, each scale with a blue vertical streak; head, thoracic region, and caudal fin with reticulated, blue, darker edged lines. Vertical fins with a yellow hue and black margin; dorsal and anal with numerous small blue dots (Günther).

This species is placed in the present list because a specimen from Riukiu is in the Imperial Museum of Tokyo. It is regarded by us as the type of a distinct subgenus *Amphices*, distinguished from *Anampses* by the small scales (50 instead of 30).

(*geographicus*, from the map-like markings.)

¹*Ἀμφήκης* (double biting).

13. STETHOJULIS Günther.

Stethojulis GÜNTHER, Cat. Fish., IV, 1862, p. 140 (*strigiventer*.)

Body oblong, compressed, covered with large scales, 25 to 30 in lateral line, those of the thorax enlarged, larger than those of the rest of the body; head scaleless; lateral line not interrupted; mouth small: canines small, close-set, those of the upper jaw very short, those of the lower jaw forming a cutting edge; large posterior canines present; fins low; dorsal rays IX, 11; anal rays III, 11, the spines short and pungent. Small fishes of the coral reefs allied to *Halichoeres*, but the anterior canines much less developed and the posterior canine wanting. Coloration always exquisite.

(στέθος, breast; *Julis*.)

- a. Head and body with distinct bright red stripes (gray in spirits), one along base of dorsal, one through eye to middle of caudal, one below eye to base of pectoral, and one along side of belly; a blue-black spot on opercle... *psacas*, 22.
- aa. Head and body without distinct red stripes.
 - b. Lower part of sides with yellowish longitudinal stripes and some black dots; a black spot at base of last dorsal ray *strigiventer*, 23.
 - bb. Lower part of sides posteriorly, with leaden blue spots and markings; a dark band above pectoral anteriorly edged with pearly white *terina*, 24.
 - bbb. Lower part of sides without spots or stripes; a brownish black lateral band, wider and less distinct anteriorly; a pale stripe below eye; a dark axillary spot *trossula*, 25.

22. STETHOJULIS PSACAS Jordan and Snyder, new species.

Head $3\frac{2}{3}$ in length; depth $3\frac{1}{2}$; depth of caudal peduncle 3; eye $5\frac{1}{2}$ in head; interorbital space 4; snout $2\frac{3}{4}$; D. IX, 11; A. III, 10; scales in lateral series, 26; between lateral line and insertion of dorsal, 2; between lateral line and insertion of anal, 9.

Body rather elongate, greatly compressed, breast and back sharp, caudal peduncle narrow, dorsal and ventral outlines evenly rounded; head large, snout rather blunt, interorbital space convex. Eye nearer to tip of snout than to posterior edge of opercle, a distance equal to diameter of pupil. Jaws equal, lips thin, small, pendulous. Teeth in a single row in each jaw; blunt, incisor-like, two small canines at tip of each jaw, a posterior canine on each side of upper jaw. Preopercle smooth, opercle with a narrow angular flap. Pseudobranchiæ large; gill-rakers on first arch 9+15, short and pointed near middle of arch, growing stumpy toward the ends, the outer ones reduced to mere knobs. Scales large, those on breast below pectoral and before ventrals greatly enlarged, those on occiput and on base of pectoral very small; a narrow sheath of one row of small scales along base of dorsal; anal without sheath, small scales on base of caudal, the last scale of lateral line very large, pointed; head naked. Lateral line continuous, abruptly bent downward below base of soft dorsal, a

branch of lateral line forming a V across occiput at anterior border of scales. Spinous dorsal low, the spines rather strong, the posterior ones but little longer than the anterior ones, $3\frac{1}{2}$ in head, longest ray $3\frac{1}{2}$. Anal spines weak, the first minute, the third equal in length to diameter of eye; the longest ray $3\frac{1}{2}$ in head. Caudal rounded posteriorly, its length $1\frac{1}{2}$ in head. Ventrals short, reaching about half way between their base and anal opening. Pectorals inserted high up, the base nearly horizontal, making the fin point upward. Fin membranes all thin and transparent.

Color in spirits. A light grayish stripe, bright red in life, extending from snout through upper edge of eye, along side of body parallel with lateral line to middle of base of caudal, wider on body and lighter in color than on head; the stripe with a short fork on opercular flap, including a conspicuous brown spot; a similar, broader stripe

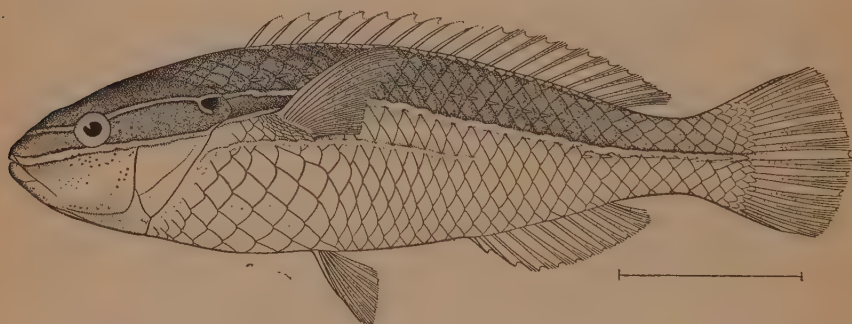


FIG. 5.—*STETHOJULIS PSACAS*.

from snout, below eye, across cheek, ending on body above lower edge of base of pectoral; a third line originating on edge of shoulder girdle, just behind gill-opening, passing upward, then curving backward below base of pectoral and ending on body at a point above insertion of anal; a faint stripe along base of dorsal not extending on head. Color above the lower stripe on head and anterior part of body, and above upper stripe on remainder of body, brownish, below the upper stripes the body is bluish gray, the scales indistinctly edged with dusky. Fins all plain.

A single specimen of this species, 115 millimeters long, was obtained from Nafa, in Okinawa, in the Riukiu Islands. It is registered as type No. 6850, Zoological Museum, Stanford University. The species is very near *Stethojulis renardi* Bleeker, but the markings are somewhat different.

(ψάκας, spot.)

23. *STETHOJULIS STRIGIVENTER*¹ Bennett.

Julis strigiventer BENNETT, Proc. Zool. Soc., 1832, p. 184; Ile de France.—CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 468 (after Bennett).

Stethojulis strigiventer BLEEKER, Atlas Ichth., 1862, p. 135, pl. XLIII, fig. 1; Bawean, Singapore, Celebes, Amboyna, Ceram, Timor, etc.—GÜNTHER, Cat. Fishes, IV, 1862, p. 140; Mauritius, Mozambique, Amboyna, Port Essington.—DAY, Fishes India, 1885, p. 397, pl. LXXXIV, fig. 7; Nicobars, Andamans.—ISHIKAWA, Prel. Cat., 1897, p. 29; Miyakoshima, one of the Riukiu Islands.

D. IX, 11; A. II, 11; scales in lateral line 26; in tranverse series 2+9. The height of the body is one-fourth the total length; the length of the head two-sevenths; caudal rounded; ventral rather short. Greenish, lower parts of the sides with several yellow, longitudinal lines and with some black dots; a brownish band from the mouth below the eye to the operculum; a black dot at the base of the penultimate dorsal ray; sometimes a small black spot on the base of the caudal fin. (Günther.)

There are no doubt three anal spines in this species, as in *Stethojulis albovittata* of the Hawaiian Islands, and in other species of the genus, the first spine being so small as to easily escape observation.

This species, common in the Indian region, is placed in the present list because a specimen from the Riukiu Islands is in the Imperial Museum of Tokyo.

(*striga*, stripe; *venter*, belly.)

24. *STETHOJULIS TERINA* Jordan and Snyder, new species.

Julis sp. No. 508 ISHIKAWA, Prel. Cat., 1897, p. 29; Boshu.

Head $3\frac{3}{8}$ in length; depth $3\frac{1}{4}$; depth of caudal peduncle $8\frac{1}{4}$; eye $5\frac{1}{2}$ in head; interorbital space $3\frac{1}{2}$; snout $2\frac{3}{8}$; D. IX, 11; A. III, 11; scales in lateral series 25; between lateral line and insertion of dorsal 3; between lateral line and insertion of anal 9.

Body rather elongate; compressed; caudal peduncle narrow, dorsal outline slightly arched, curving almost evenly from snout to caudal peduncle, there being no sudden descent at base of caudal fin. Head long, the snout pointed; jaws equal; interorbital space convex; eye small, nearer snout than edge of opercle, a distance equal to diameter of pupil. Lips thin, pendent, those of the lower jaw divided by a narrow median ridge. Teeth blunt, closely apposed, in a single series in each jaw, the anterior ones not enlarged nor canine-like; a strong canine projecting forward on each side of posterior part of upper jaw. Gill-membranes narrowly restricted to isthmus. Pseudobranchiae

¹The following species is recorded from Kobe in Karoli's list probably by error for *Stethojulis terina*:

STETHOJULIS INTERRUPTA (Bleeker).

Julis interrupta BLEEKER, Banda I, p. 252.

Stethojulis interrupta GÜNTHER, Cat. Fish., IV, 1862, p. 142; Amboyna.—BLEEKER, Atlas Ichth., p. 133, pl. XLIV, fig. 4; Celebes, Amboyna, Ceram, etc.—KAROLI, Prodr. Pisc. Asiae, Orient, 1882, p. 28; Kobe (probably an error).

large; gill-rakers on first arch $7+12$, very short, the outer 5 or 6 on lower limb reduced to mere projections. Preopercle smooth, opercle with a broad, terminal flap. Head naked, fins without basal sheath of scales, scales of breast not greatly reduced in size, those of nape very small and elongate. Lateral line complete, bent abruptly downward below base of dorsal fin. Dorsal spines slender, short, the longest $3\frac{1}{2}$ in head; rays scarcely longer than spines. First anal spine very small, concealed, the succeeding spines small and weak, the third contained $6\frac{1}{2}$ times in head; longest ray $3\frac{1}{3}$; caudal rounded, $1\frac{1}{2}$ in head. Upper rays of pectoral longest, $1\frac{1}{2}$ in head, the others gradually shorter. Ventrals rounded, short, not reaching much over halfway between their base and anal opening.

Color in spirits light, yellowish brown, darker on upper half of body; a dark band narrowly edged with white extending backward from upper edge of base of pectoral, becoming narrow, broken, and finally disappearing near tip of pectoral; four lines of small brown

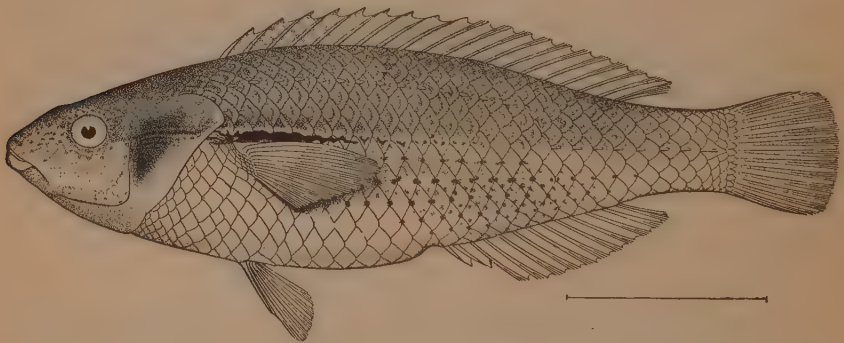


FIG. 6.—*STETHOJULIS TERINA*.

spots, one on each scale, extending along sides of lower half of body, except the breast and belly; an indistinct, narrow, dark line extending from eye to edge of opercle; dorsal indistinctly mottled, the other fins plain. Males and females alike in color and other characteristics.

Described from a specimen about 105 millimeters long from Misaki. Other specimens of both sexes from Misaki, Wakanoura, and from Kominato, in Boshu, differ but slightly from the specimen described.

In life, the species is olive brown, the marks on side pearly white and blue black, the spots leaden blue; snout orange; base of pectoral marked by dull orange; fins reddish pearl.

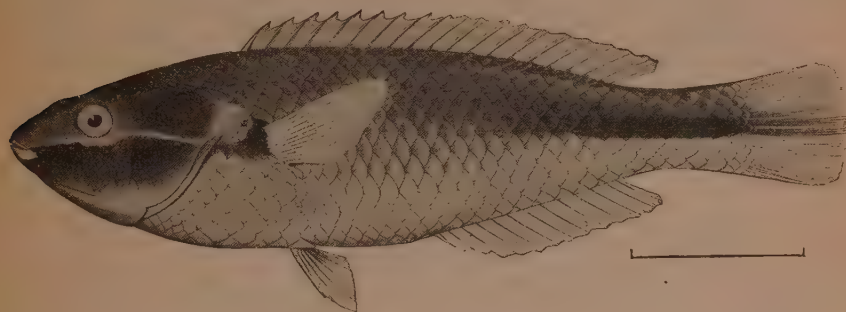
This beautiful species is common about the tide pools and the rocks washed by the Kuro Shiwo. The species is very close to the *Stethojulis kalosoma* of the East Indies, but our specimens show none of the red or blue shades indicated in Bleeker's plate, and it is not probable that they belong to the same species. The type is No. 6851, Stanford Univ.

(τερήν, τέπεινα, exquisite.)

25. *STETHOJULIS TROSSULA* Jordan and Snyder, new species.

Head $3\frac{1}{2}$ in length; depth $3\frac{3}{4}$; depth of caudal peduncle 9; eye $5\frac{1}{4}$ in head; interorbital space 4; snout $2\frac{3}{8}$; D. IX, 11; A. III, 11; scales in lateral series 26; between lateral line and insertion of dorsal 3; between lateral line and insertion of anal 9.

Body elongate, caudal peduncle rather narrow, dorsal and ventral contours evenly curved, breast with a sharp ridge. Snout pointed, jaws equal, lower lip thin, pendulous, parted mesially into lateral lobes. Teeth in a single row, small, blunt, no anterior canines, a pair of strong posterior canines present. Edge of preopercle entire; opercle with a broad flap. Pseudobranchiæ large; gillrakers on first arch $6 + 15$, most of those on the lower limb reduced to mere knobs; gill membranes well separated by a rather broad isthmus. Scales of breast like those of sides, not larger, those near gill openings small; scales on occiput and base of pectoral minute; dorsal and anal without basal sheaths; caudal with small scales on basal part; head naked.

FIG. 7.—*STETHOJULIS TROSSULA*.

Lateral line complete, abruptly bent downward below base of soft dorsal. Dorsal spines low, moderately strong, the longest $4\frac{1}{2}$ in head, longest ray $2\frac{3}{4}$. First anal spine very small, concealed, the third $4\frac{1}{2}$ in head; longest ray $3\frac{1}{2}$. Caudal rounded, $1\frac{3}{4}$ in head. Ventrals reaching to within an eye's diameter of anal opening. Pectorals $1\frac{1}{2}$ in head. Membranes of fins thin and transparent, not thickened about the spines or rays.

Color in alcohol, chocolate brown above, much lighter below, the dark color ceasing abruptly a little above middle of sides, a broad brownish black band on caudal peduncle, which widens and becomes indistinct anteriorly; a dark patch bordered above and below with yellowish white, before base of pectoral; a dark spot on upper part of axil; head darker than body, the dark area extending to the lower edge of preopercle; a white stripe somewhat narrower than pupil extending from tip of snout, below eye, to edge of opercle; lower part of body with 4 indistinct, dark longitudinal stripes. Middle of caudal brownish; other fins plain.

Of this species we have but one specimen, which measures 120 millimeters, from Misaki. It is recorded as type No. 6852, Zoological Museum, Stanford University.

It is near *Stethojulis phkadopleura* Bleeker, of the East Indies, but differs in coloration, as it also differs from *S. terina*.

(*trossula*, a belle, or elegant young woman.)

14. HEMIGYMNUS Günther.

Hemigymnus GÜNTHER, Ann. Mag. Nat. Hist., 1861, p. 386 (*fusciatus*).

Body compressed, oblong, covered with rather large scales, 30 in lateral lines; lateral line continuous; opercles naked; cheek with a stripe of very small scales; preopercle entire. Lips thick and pendent; teeth uniserial; canines $\frac{3}{2}$; a posterior canine tooth; fin rays, D. IX, 11; A. II, 11. East Indies.

(*ἥμι*, half; *γυμός*, naked.)

26. HEMIGYMNUS MELAPTERUS (Bloch).

Labrus melapterus BLOCH, Ichthyologia VIII, p. 111, pl. CCLXXXV; Japan.

Tautoga melapterus CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 311; Java.—BLEEKER, Verh. Bat. Genootsch, XXII, p. 16.—RICHARDSON, Ann. Mag. Nat. Hist., 1843, XI, p. 358.

Hemigymnus melanopterus GÜNTHER, Cat. Fish., IV, 1862, p. 139; Celebes, Java, Port Essington, Endeavor Reef, Australia.—BLEEKER, Atlas Ichth., p. 142, pl. XLV, fig. 203; Java, Duizend Islands, Cocos, Sumatra, Batu, Nias, Singapore, Bintang, Celebes, Amboyna, Ceram, Goram.—DAY, Fishes India, p. 396, pl. LXXXIV, fig. 2, 1885; Andamans.—ISHIKAWA, Prel. Cat. 1897, p. 29; Riukiu Islands.

D. IX, 11; A. III, 11; scales in lateral line 29; in transverse series 5 + 14.

A posterior canine tooth hidden by the skin. Lips very thick, with folds; the lower lip is notched anteriorly, each lateral part pendent like a wattle. Cheek with a band of small scales. Back and sides between the vertical fins brownish, abdomen and thoracic region yellowish; a blackish blotch behind the orbit; dorsal and anal fins with a slight margin, and with a bluish intermarginal band edged with darker. (Günther).

This species is included in the present list because it was originally described from Japan and a specimen from Riukiu is now in the Imperial Museum.

(*μέλας*, black; *περόν*, fin.)

27. HEMIGYMNUS FASCIATUS (Thunberg).

Mullus fasciatus THUNBERG, Reise nach Japan, IV, 1791, p. 351, pl. cccxiv; City of "Meaco" (doubtless Miyakoshima, Temple Island, one of the Riukiu group).

Labrus fasciatus BLOCH, Ichthyol., VIII, p. 6, pl. ccxc, about 1792; Japan.

Tautoga fasciata CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 303, pl. CCCLXXIX; Ile de France.

Hemigymnus fasciatus GÜNTHER, Ann. Mag. Nat. Hist., 1861, p. 386.—BLEEKER, Atl. Ichth., 1862, p. 141, pl. XLVI, fig. 2; East Indies, Mauritius, Ceylon.—GÜNTHER, Cat. Fish., IV, 1862, p. 138; Amboyna.—DAY, Fish. India, 1885, p. 396.

Sparus fuliginosus LACÉPÈDE, Hist. Poiss., III, 1802, p. 437; Ile de France.

Sparus malapteronotus LACÉPÈDE, Hist. Poiss., III, 1802, p. 450; Ile de France.

Sparus zonephorus LACÉPÈDE, Hist. Poiss., IV, 1803, p. 155 (after Bloch).

Sparus meaco LACÉPÈDE, Hist. Poiss., IV, 1803, p. 161 (after Thunberg).

Scarus quinquefasciatus BENNETT, Fishes Ceylon, 1839, pl. XXIII; Ceylon.

? *Tautoga mertensi* CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 308; Carolines.

Cheilinus blochi CUVIER and VALENCIENNES, Hist. Poiss., XIV, 1837, p. 108 (after *Labrus fasciatus* Bloch).

? *Tautoga leucomus* BLEEKER, Bliliton, IV, p. 239; Bliliton.

? *Hemigymnus leucomus* GÜNTHER, Cat. Fish., IV., 1862, p. 139.

D. IX, 11; A. III, 11; scales in lateral line 30; in transverse series 5 + 11. A posterior canine tooth. Lips very thick, with folds; the lower lips are notched anteriorly, broad, pendent, like wattles; cheek with a band of small scales. Body with 5 brownish-black cross bands; ventral and anal blackish; the lower half of the soft dorsal yellowish, the upper blackish. A brownish spot behind the eye. (Günther.)

This species is here included because it was originally described from Japan, doubtless from the island of Myiako in the Riukiu. This must be near its northern limit.

(*fasciatus*, banded.)

13. GÜNTHERIA Bleeker.

Güntheria BLEEKER, Proc. Zool. Soc. Lond., 1861, p. 412 (*trimaculatus*).

? *Hemitautoga* BLEEKER, Proc. Zool. Soc. Lond., 1861, p. 413 (*centiquadra*).

This genus differs from *Halichæres* in the presence of small scales on the cheeks behind the eyes; base of dorsal with a more or less distinct scaly sheath. Bleeker divides the genus into two: *Güntheria*, with two canines in the lower jaw, and *Hemitautoga*, with four. The two differ otherwise but slightly, and both are near *PlatyGLOSSUS* and *Halichæres*.

(Named for Dr. Albert Günther.)

23. GÜNTHERIA TRIMACULATA (Quoy and Gaimard).

Julis trimaculata QUOY and GAIMARD, Voyage Astrolabe, Zool., II, 1834, p. 705, pl. XX, fig. 2; Vanicolo.—CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 452; Vanicolo.

Güntheria trimaculata BLEEKER, Atlas Ichth., p. 138, pl. XXXII, fig. 1; East Indies.

PlatyGLOSSUS trimaculatus GÜNTHER, Cat. Fish., IV, 1862, p. 153; East Indies.—ISHIKAWA, Prel. Cat., 1897, p. 29; Riukiu Islands.

Julis spilurus BLEEKER, Banda, I, p. 252; Banda.

D. IX, 11; A. III, 11; scales in lateral line 29; in transverse series 10 + 15. The height of the body equals the length of the head, and is rather more than one-fourth of the total. Caudal truncated; head

with a broad bluish band from the snout, below the eye, bent downward across the operculum and suboperculum; several other oblong spots above this band; a crescent on the interoperculum and the margin of the suboperculum bluish; an oblique white streak from the axil to the belly. Each scale with a bluish vertical streak; a dark brown spot near the root of the caudal, above the lateral line; sometimes one or two other brown spots on the side of the body. Dorsal with three, anal with two longitudinal lines, which are whitish in spirits; a small black spot superiorly in the axil. (Günther.)

This species is represented in the Imperial Museum by a specimen from Riukiu.

(*tres*, three; *maculatus*, spotted.)

16. HALICHÆRES¹ Rüppell.

Halichæres RÜPPELL, Neue Wirbelthiere Fische, 1837, p. 16 (*bimaculatus*, not *Halichærus* Nilsson, 1820, a genus of seals).

*Ichthyacallus*² SWAINSON, Nat. Hist. Classe Fishes, II, 1839, p. 232 (*dimidiatus*).

Chærojulis GILL, Proc. Ac. Nat. Sci. Phila., 1862, p. 142 (substitute for *Halichæres*, regarded as preoccupied).

Parajulis BLEEKER, Enum. Poiss. de Japan, 1879, p. 5, (*pæcilopterus*, no definition.)

Iridio JORDAN and EVERMANN, Check List Am. Fishes, 1896, p. 412 (*radiatus*).

Body oblong, compressed, not elevated, covered with large scales, there being 25 to 30 in the course of the lateral line, which is not interrupted, but bent abruptly behind; scales on breast a little smaller. Head scaleless, compressed conic; preopercle entire. Teeth large, two to four strong canines in front of each jaw, a posterior canine tooth. Fin rays usually D. IX, 11; A. III, 11; fins low; caudal lunate, truncate or rounded; ventrals inserted under axil of pectoral. Gill-rakers short and feeble; gill membranes slightly joined to the narrow isthmus; no scaly sheath at base of dorsal. Vertebrae 10+15=25. Species numerous, of rather small size and gay coloration, the typical species (with canines $\frac{4}{1}$) all belonging to the East Indies and Polynesia, those with canines $\frac{2}{1}$ (*Ichthyacallus*) being all American.

(ἄλς, sea; χοῖρος, pig).

I. HALICHÆRES: canines $\frac{4}{1}$.

- a. Dorsal spines relatively firm and low, the longest 3 in head; depth $3\frac{1}{2}$ in length; anterior canines strong, dorsal rays IX, 14; anal rays IX, 14; males with a brownish lateral band, a large brown spot near end of pectoral; head with light blue markings; female with a blackish lateral band and a similar dark streak above it at base of dorsal extending forward to snout, besides several lines of dark spots.....*pæcilopterus*, 29.

¹*PlatyGLOSSUS* (Klein) Bleeker (*marginatus*), differs from *Halichæres* in the presence of a scaly sheath at base of dorsal.

²The first species named under *Ichthyacallus* (*dimidiata*) belongs to the group called *Iridio*. The name *Ichthyacallus* may be restricted to that species and its affinities, replacing *Iridio*, if this subgenus (composed of American species with the canines $\frac{2}{1}$) is deemed worthy of recognition.

- aa. Dorsal spines high and very slender, the longest about $2\frac{1}{2}$ in head; depth about 4 in length; anterior canines small; dorsal rays IX, 12; anal rays III, 12; a black axillary spot.
- b. Dorsal fin (in male) blotched and edged with black; sides with a pale lateral shade; caudal dark with pale edges; anal dark at base, with three longitudinal bands *bleekeri*, 30.
- bb. Dorsal fin mottled, but without black spot or edging; no distinct color markings except the black axillary spot *tremebundus*, 31.

29. HALICHERES PÆCIOPTERUS (Schlegel).

AOBERA (BLUE BERA) MALE; AKABERA (RED BERA) FEMALE.

Julis pæciopterus SCHLEGEL, Fauna Japonica, Poiss, 1846, p. 169, pl. LXXVI bis. fig. 1; Nagasaki (male).—RICHARDSON, Ichthyol. China, 1846, p. 260; Canton.—BREVOORT, Exped. Japan, 1856, p. 271; Shimoda.

PlatyGLOSSUS pæciopterus GÜNTHER, Cat. Fish., IV, 1862, p. 166; China.—KAROLI, Prodr. Pisc. Asiæ, Orient, 1882, p. 28; Hakuri.—STEINDACHNER, Fische Japans, IV, 1887, p. 19; Tokyo; Reise Aurora, 1896, p. 215; Kobe.—ISHIKAWA, Prel. Cat., 1897, p. 28; Tokyo, Boshu.—JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 756; Yokohama; Proc. U. S. Nat. Mus., 1900, p. 359; Tokyo.

HalicHERES pæciopterus JORDAN and SNYDER, Check List, 1901, p. 87; Yokohama, *Julis pyrrhogramma* SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 170, pl. LXXXVI bis. fig. 2; Nagasaki (female).

PlatyGLOSSUS pyrrhogramma GÜNTHER, Cat. Fish., IV, 1862, p. 166, after Schlegel.—KAROLI, Prodr. Pisc. Asiæ Orient., 1882, p. 28; Yokohama, Hakuri.—STEINDACHNER, Fische Japans, IV, 1887, p. 19; Tokyo, Tango; Reise Aurora, 1896, p. 214; Kobe.—ISHIKAWA, Prel. Cat., 1897, p. 29; Tokyo, Boshu.

HalicHERES pyrrhogrammus JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 359; Tokyo; Check List, 1901, p. 87; Yokohama.

Julis thersites RICHARDSON, Ichth. China, 1846, p. 260; Canton.

Head $4\frac{1}{10}$ in length; depth $3\frac{1}{2}$; depth of caudal peduncle $7\frac{1}{2}$; eye 6 in head; interorbital space $4\frac{1}{8}$; snout $2\frac{3}{4}$; D. IX, 14; A. III, 14; scales in lateral series 26, between lateral line and insertion of dorsal 3, between lateral line and insertion of anal 8.

Body elongate, compressed, the dorsal contour not elevated. Interorbital area very convex, eye slightly nearer to tip of snout than to edge of opercle. Snout pointed, the jaws equal, the mouth rather small. Teeth in a single series laterally, coalesced at bases, the tips distinct; a large fang projecting forward from posterior part of upper jaw; four large curved canines in anterior part of both jaws, the two middle ones of upper jaw largest. Edge of preopercle entire. Opercle with a large flap. Gill rakers on first arch 6+9 short, pointed.

Scales before dorsal small in about seven rows, crossing the median line. Head entirely naked; fins without sheath at base. Lateral line complete, abruptly bent downward below base of soft dorsal.

Membrane of spinous dorsal not incised, the spines relatively firm, longest spine 3 in head, longest ray $2\frac{1}{2}$. Anal spines weak, the second $5\frac{1}{2}$ in head, longest ray $2\frac{1}{2}$. Caudal rounded, its length $1\frac{1}{4}$ in head; length of pectoral $1\frac{3}{8}$; ventral $1\frac{1}{2}$ in head, short, not filamentous, not reaching vent.

Color in spirits; male, light yellowish brown, a brownish band a little wider than orbit, extending along back, a similar band below the lateral line, extending from gill opening to base of caudal; a large dark brown spot on body below end of pectoral; scales of body anterior to the brown spot, and below the median dark band, with large light spots; head with elongate spots and longitudinal light blue bars bordered with dark brown, one extending between tip of snout and eye, another along cheek and side of head; an indistinct greenish band running obliquely backward and downward from occiput. Dorsal with broad dusky reticulations, which inclose round bluish-white spots on greater part of fin, leaving a light band near the dusky margin; anal similar in color; caudal with vertical light bars, which are in places broken up into spots; ventrals and pectorals plain.

Described from a male specimen 230 millimeters long from Nagasaki.

The females differ strikingly from the males in color. Body with a sharply defined dark brown band, overlaid with red, one half a scale in width, extending from tip of snout to base of caudal; below this at intervals about equal to the band in width are two dark broad lines, the lower indistinct; above the band, with intervals about equal to its width, are two rows of dark spots, one on the anterior part of each scale, the spots and lines not extending on head; above the dots a dark brown band similar to the median one runs from snout to end of dorsal fin, where it unites with its fellow on the opposite side, and extends along upper edge of caudal peduncle; on the upper part of head the bands are united on the snout and broken into two oblong bars on the occiput. Fins orange in life, the dorsal with a slight clouding of dusky.

This species is found in shallow bays and about rocks everywhere in Japan from Hakodate southward. Both males and females are brightly colored and the two sexes are quite unlike in pattern. For this reason the two have been accepted as distinct species without any question until the present time. Their identity has been shown by dissection of many examples. Our specimens in all cases representing both sexes are from Aomori, Matsushima, Tokyo, Misaki, Wakanoura, Kobe, Onomichi, Hiroshima, Tsuruga and Nagasaki.

(ποικιλός, variegated: πτερόν, fin.)

30. *HALICHÆRES BLEEKERI* (Steindachner and Döderlein.)

HONBERA (ORIGINAL BERA).

?*Platyglossus tenuispinis* GÜNTHER, Cat. Fish., IV, 1862, p. 161; China Sea (perhaps a faded female, but the ventrals said to be shorter than the pectorals and the dorsal spot on three spines only).—KAROL, Prodr. Pisc. As., Orient, 1882, p. 28; Nagasaki.

Platyglossus bleekeri STEINDACHNER and DÜDERLEIN, Fische Japans, IV, 1837, p. 19; Tokyo.

Halichares bleekeri JORDAN and SNYDER, Proc. U. S. Nat. Mus., 1900, p. 359, Tokyo; Check List, 1901, p. 87; Yokohama.

Head 4 in length; depth 4; depth of caudal peduncle 7; eye $4\frac{1}{2}$ in head; snout $2\frac{2}{3}$; interorbital space $4\frac{1}{4}$; D. IX, 12; A. III 12; scales in lateral series 25, between lateral line and insertion of dorsal 2, between lateral line and insertion of anal 8.

This species is characterized by its slender body, high and flexible dorsal spines and the small number of dorsal and anal rays. Canines very small, scarcely differentiated, $\frac{1}{4}$. Scales before dorsal small, crossing the median line in about 8 rows.

Longest dorsal spine 2 in head, very slender; longest ray $2\frac{1}{5}$. Anal spines short, slender, the second about equal to diameter of eye; longest ray $2\frac{1}{2}$ in head. Caudal rounded. Outer ray of ventral filamentous, longer than the pectoral, at least in the male.

Color in spirits brownish, shaded with blue, an indefinite light band extending along side of body; head with two dark bands, one below eye, the other above, occasionally one or both are very indistinct or absent; a small black blotch at upper edge of base of pectoral; dorsal broadly bordered with brownish, the border growing wider anteriorly, where it is almost black, the base of fin with a row of large round light spots, which in some specimens are united to form a band; caudal dark, the dorsal and ventral edge light; anal with three broad longitudinal bands, separated by very light lines, the basal band dark, the outer ones slighter; ventrals and pectorals plain.

The female is unknown to us. Of 24 specimens about 150 millimeters long from 6 localities all are males. It is possible that *Halichoeres tenuispinis* (Günther), with the black on the dorsal restricted to a single spot and the ventrals not filamentous and shorter than the pectorals, may prove to be the same species.

This species is generally common throughout southern Japan, and may be recognized by the height and slenderness of the dorsal spines and the dark color of the fins.

Our specimens are from Tokyo, Misaki, Kobe, Onomichi, Hiroshima, and Nagasaki.

(Named for Dr. Pieter van Bleeker.)

31. HALICHERES TREMEBUNDUS Jordan and Snyder, new species.

Head $3\frac{2}{3}$ in length; depth $4\frac{1}{6}$; depth of caudal peduncle $7\frac{1}{3}$; eye $4\frac{1}{2}$ in head; interorbital space 4; snout $2\frac{5}{8}$; D. IX, 12; A. III, 12; scales in lateral series 25; between lateral line and insertion of dorsal 1 or 2; between lateral line and insertion of anal 9.

Body elongate, compressed, dorsal outline not elevated, upper anterior profile evenly curved from tip of snout to origin of dorsal fin, the caudal peduncle deep. Head pointed, snout sharp, the jaws equal. Teeth in a single series laterally, closely apposed but not coalesced, growing gradually larger toward tip of snout, the anterior canines not much enlarged, $\frac{1}{4}$, a few minute teeth behind the canines; a small

posterior canine present. Pseudobranchiæ large; gill-rakers on first arch $3 + 9$, small, pointed. Eye nearer to tip of snout than to edge of opercle a distance about equal to two-thirds its diameter. Edge of preopercle smooth, opercle with a flap equal in length to diameter of eye. Lips thin, the lower one pendant on the sides of mouth, divided anteriorly. Scales before dorsal small in 6 or 8 rows, crossing the median line.

Scales not forming a sheath at base of fins, smaller on belly than on upper parts, very small on nape and breast; head entirely naked. Lateral line complete, abruptly bent downward below base of soft dorsal.

Membrane of spinous dorsal not incised, the spines slender, short, the longest $2\frac{1}{4}$ in head; dorsal rays slightly higher than spines. Anal spines very small and weak, the third about $3\frac{1}{2}$ in head, longest ray 2. Dorsal and anal rays when depressed not reaching base of caudal. Caudal rounded, $1\frac{1}{2}$ in head. Pectoral rather truncate posteriorly, $1\frac{1}{2}$ in head. Ventrals filamentous, $1\frac{3}{4}$ in head.

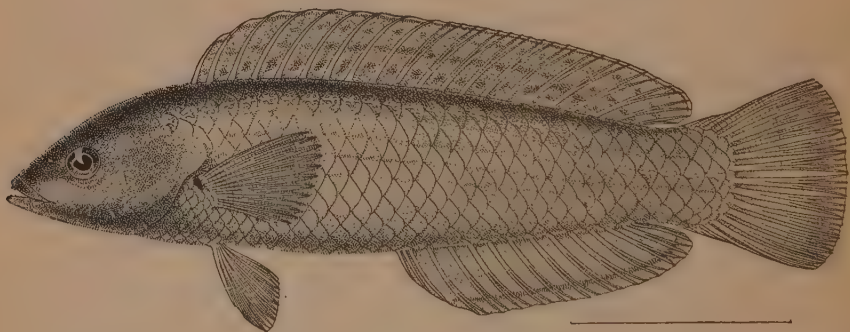


FIG. 8.—HALICHTHYS TREMEBUNDUS.

Color in spirits, dusky above, lighter below; a small, distinct brownish black spot on upper edge of base of pectoral; dorsal pale, mottled with pale brownish, without black spot or edging; iris green.

Described from a specimen about 100 millimeters long, Type No. 6853, Leland Stanford Junior University Museum, from Hiroshima. We have examined both males and females and find no external differences.

It is one of the smallest and slenderest species of the genus, differing principally in color and in greater slenderness from *H. bleekeri*. We have 15 specimens, from Misaki, Hiroshima, Kobe, Wakanoura, Onomichi, and Nagasaki.

(*tremebundus*, timid.)

17. CORIS Lacépède.

Coris LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 96 (*aygula*).

Body compressed, oblong, covered with moderate or small scales, about 60 in the lateral line; head scaleless; lateral line not interrupted;

posterior canine tooth absent; fin rays, dorsal IX, 12; anal III, 12; anterior dorsal spines usually produced and flexible; caudal rounded.

Polynesia, the species few; deeply colored fishes of the coral reefs.

The genus *Coris*, as understood by Günther, differs from *Halichæres* in its small scales. It comprises a great variety of forms, and is divisible into six well-marked genera or subgenera, distinguished as follows:

- a. Scales in lateral line 50 to 85.
- b. Posterior canine obsolete; head naked; caudal rounded; scales 60.....*Coris*.
- bb. Posterior canine present.
- c. Head with a patch of scales behind the eye; caudal rounded; scales 50.
Ophthalmolepis.
- cc. Head entirely naked.
- d. Caudal rounded or truncate.
- e. Scales 55 to 65.....*Hemicoris*.
- ee. Scales 70 to 85.....*Julis*.
- dd. Caudal forked, the lobes much produced in the adult; scales 73.

Pseudocoris.

- aa. Scales in lateral line about 120; body oblong; head naked; no posterior canine.
Hologymnosus.

Of these groups we here recognize *Coris*, *Julis*, *Ophthalmolepis* (*lineolata*), and *Hologymnosus* (*fasciatus*) as distinct genera. It is not unlikely that *Pseudocoris* (*heteroptera*) is entitled to similar rank.

(κορύς, a helmet, from the adipose hump on the forehead in old individuals of *Coris aygula*, “à cause de l’espèce de casque qui envelope et surmonte la tête,” the first dorsal spines being compared to the plume in the helmet.)

- a. Scales in lateral line 50 to 60; posterior canine obsolete or nearly so.
- b. Anterior dorsal rays much produced; body robust; color blue-black almost uniform.....*aygula*, 32.

32. CORIS AYGULA Lacépède.

Coris aygula LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 96, pl. iv, fig. 1; Ile de France.—GÜNTHER, Cat. Fish., IV, 1862, p. 201; Red Sea, India, Australia.—DAY, Fish. India, 1885, p. 408 (with a figure representing some species of *Hologymnosus*).

Coris angulata LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 96, pl. iv, fig. 2; Ile de France (dorsal spines not produced).

Julis gibbifrons QUOY and GAIMARD, Voy. Astrolabe, Poiss., 1834, p. 707, pl. xix, fig. 3; Ile de France.

Julis coris CUVIER and VALENCIENNES, Hist. Nat. Poiss., XIII, 1839, p. 491; Ile de France.

Head $3\frac{3}{4}$ in length; depth 3; depth of caudal peduncle 6; eye 7 in head; snout $2\frac{1}{2}$; interorbital space $3\frac{2}{3}$; D. IX, 12; A. III, 12; scales in lateral series 61; between lateral line and insertion of dorsal 5; between lateral line and insertion of anal 24.

Body moderately compressed, caudal peduncle deep, dorsal contour ascending rapidly from tip of snout to insertion of dorsal, ventral outline more gently and evenly curved, interorbital space convex.

Snout short, bluntly pointed, jaws equal, lower lip thin, divided into 2 lateral pendent lobes. Teeth closely apposed or coalesced at base, the points distinct, in a single series, 2 strong blunt canines on tip of each jaw, 2 or 4 smaller teeth in a row behind the canines; no posterior canines present. Preopercle entire, opercle with a broad flap, its length 5 in head. Gill-rakers on first arch 6 + 11, moderately long, slender, pointed; pseudobranchiæ large.

Scales moderate, much reduced on nape and on pectoral region. dorsal and anal fins without basal sheath, small scales extending far out on interradi al membranes of caudal, head naked. Lateral line complete, abruptly bent downward below base of soft dorsal.

Dorsal spines long and slender, not pungent, the longest $2\frac{1}{2}$ in head, longest ray $1\frac{2}{3}$; anal spines similar to those of dorsal, the rays equal to those of dorsal in length; the membranes of both fins thick. The caudal and pectorals of our specimen are so worn, it having been con-



FIG. 9.—*CORIS AYGULA*.

fined in a floating basket, that their shape and length can not be determined. Outer rays of ventrals lengthened, the fins reaching base of first anal ray.

Color in alcohol, uniform blue-black, the scales with a somewhat lighter edge, the fins much darker than the body.

Color in life deep green, the scales edged with brownish; a bluish green vertical band behind end of depressed pectoral; caudal with a wash of blue on posterior parts, dorsal and anal with golden brown reticulations.

One specimen of this fine species was obtained at Wakanoura.

(*aygula* is defined as egret by Lacépède; the long dorsal spines being compared to a plume on a helmet.)

18. *JULIS* Cuvier.

Julis CUVIER, Règne Animal, 1st ed., I, 1817, p. 261 (*julis*).

Hemicoris BLEEKER, Proc. Zool. Soc. Lond., 1861, p. 412 (*variegata*).

?*Pseudocoris* BLEEKER, Proc. Zool. Soc. Lond., 1861, p. 412 (*heteroptera*.)

The genus as here understood differs from *Coris* chiefly in the presence of the posterior canine tooth. The body is usually more elongate than in *Coris*, and the scales are frequently smaller (55 to 85). In most species the anterior dorsal spines are slender and prolonged. Brilliantly colored fishes of the coral reefs, some of the species burying themselves in the sand. The name *Julis*, originally based on the Girelle of the Mediterranean (*Julis julis*), has been wrongly transferred to the genus *Thalassoma* by Bleeker and Günther.

(ιοῦλος, violet.)

33. JULIS FORMOSA (Bennett).

Labrus formosus BENNETT, Fishes Ceylon, No. 16, 1830; Ceylon.

Coris formosa GÜNTHER, Cat. Fish., IV, 1862, p. 201; after Bennett.

?*Coris formosa* BLEEKER, Atlas Ichthy., 1862, p. 99, pl. XIX, fig. 3; Celebes; Amboyna.—? DAY, Fishes India, 1885, p. 407, pl. LXXXVI, fig. 5; Malay Archipelago.

?*Coris pulcherrima* GÜNTHER, Cat. Fish., IV, 1862, p. 200; Amboyna, Tahiti, Aneitum.

Coris pulcherrima ISHIKAWA, Prel. Cat., 1897, p. 28; Riukiu Islands.

D. IX, 12; A. III, 12 (scales about 80). The anterior dorsal spines produced; caudal rounded; ventral long, pointed. Posterior canine present. Bluish-gray, with circular black spots; head yellow, with 2 oblique blue bands ascending toward the origin of the dorsal, one beginning from the snout and passing through the eye, the other parallel to the first, running below the eye. Dorsal and anal fins brown, the former with red margin, and with 2 green lines running within the red; black dots between the rays. Anal with a narrow green edge and a narrow green intramarginal line; a series of green dots within the margin. The inner half of the caudal red, the outer yellowish-white. (Günther after Bennett).

One specimen of this species from Riukiu is in the Imperial Museum at Tokyo. As the synonymy of this and related species is still uncertain, we copy the substance of the original account, not having examined the specimen recorded by Ishikawa.

(*formosus*, comely.)

19. CHEILIO Lacépède.

Cheilio (Commerson) LACÉPÈDE, Hist. Nat. Poiss., IV, 1803, p. 432 (*auratus*).

Hemulius SWAINSON, Nat. Hist. Fishes, II, 1839, p. 228 (*vittatus*).

Eupemis SWAINSON, Nat. Hist. Fishes, II, 1839, p. 232 (*fusiformis*).

Body elongate, compressed, covered with rather small scales, 45 to 50 in the lateral line; lateral line continuous; cheeks scaleless; a few rudimentary scales on the opercle; teeth small, in one series; no posterior canines; dorsal spines flexible; fins not produced. Fin rays, dorsal IX, 13, A III, 11. Polynesia to Africa, apparently a single species, varying much in color.

(χεῖλος, lip.)

34. CHEILIO INERMIS (Forskål).

Labrus inermis FORSKÅL, Descr. Anim., 1775, p. 34; Red Sea.

Cheilio inermis BLEEKER, Atlas Ichth., 1862, p. 82, pl. xxxi, fig. 4; Java, Bawian, Sumatra, Celebes, Tonga, Ternate, Amboyna, Banda, Ceram, Goram, Buro, Timor, Letti.—GÜNTHER, Cat. Fish., IV, 1862, p. 194; Mozambique, Macassar, Amboyna, Philippines, Aneitum.—DAY, Fish. India, 1885, p. 407, pl. lxxxviii, fig. 4; Malay Archipelago.—JORDAN and EVERMANN, Fishes Formosa Ms.; Formosa.

Labrus hassek LACÉPÈDE, Hist. Poiss., III, 1802, p. 513 (after Forskål).

Cheilio auratus LACÉPÈDE, Hist. Poiss., IV, 1803, p. 433; Ile de France.—QUOY and GAIMARD, Voy. Uranie, Zool., 1824, p. 274, pl. liv, fig. 2; Maui (Hawaii).—CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 341; Ile de France.

Cheilio fuscus LACÉPÈDE, Hist. Poiss., IV, 1803, p. 433; Ile de France.—CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 349 (same type).

Labrus fusiformis RÜPPELL, Neue Wirbelthiere Fische, 1837, pl. vii, fig. 4; Djedda, Massuah.

Cheilio cyanochloris CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 349; Ile de France.

Cheilio forskalii CUVIER and VALENCIENNES, Hist. Poiss., XIII, p. 349 (after *inermis* of Forskål.)

Cheilio hemichrysos CUVIER and VALENCIENNES, Hist. Poiss., XIII, p. 351; Maui (after *auratus* Quoy and Gaimard).—BREVOORT, Exped. Japan, 1856, p. 272; Riukiu.

Cheilio viridis CUVIER and VALENCIENNES, Hist. Poiss., XIII, p. 352; Vanicolo.

Cheilio microstoma CUVIER and VALENCIENNES, Hist. Poiss., p. 353; locality unknown.

Cheilio ramosus JENYNS, Voyage Beagle, Fishes, 1842, p. 102.

Cheilio bicolor BIANCONI, Zool. Mozambique, p. 254, pl. v, Mozambique.

Head $3\frac{1}{2}$ in length; depth 7; depth of caudal peduncle $3\frac{1}{4}$; eye $7\frac{1}{2}$ in head; interorbital space $7\frac{1}{2}$; snout $2\frac{1}{2}$; D. IX. 13; A. III. 12; scales in lateral series 46; between lateral line and base of dorsal 5; between lateral line and base of anal 9.

Body very elongate, moderately compressed, caudal peduncle deep; head very long and pike-like; snout long, pointed, the lower jaw slightly shorter than the upper, the lower lip thin and pendent. Teeth in a single row on each jaw, the posterior ones small close set, the anterior ones larger, two small canines at tip of upper jaw. Preopercle smooth, opercle with a large rounded flap. Gill-rakers on first arch $7 + 19$, those on upper limb short, pointed, the lower ones mostly long, very slender, some of the long ones with a minute one between them; pseudobranchiæ very large.

Scales small, somewhat reduced on nape and breast, no sheath along bases of dorsal and anal fins, head naked except a few scales on posterior edge of opercle. Lateral line complete, gently curving downward on anterior half, running along middle of body posteriorly.

Spines of dorsal slender, with soft tips, the longest $3\frac{1}{2}$ in head; longest rays 3. Anal spines weak, longest ray 3 in head. Caudal

rounded; ventral $3\frac{1}{2}$ in head, not reaching half way between their base and the vent; pectorals $2\frac{1}{4}$ in head. Fin-membranes thin, transparent, not thickened about the spines or rays.

Color in life (taken from specimens from Hawaii) olive green, varying toward rusty red, each scale with a more or less distinct blue spot, bluish shades predominating below; head with various streaks and reticulations of olive, brownish, and pearly blue; middle of side with a narrow, dark streak which breaks up posteriorly into a row of blackish spots; dorsal light orange, the color forming reticulations around pearly spots; anal similar to dorsal; caudal olive gray with a paler cross band. Some examples were olivaceous orange rather than greenish, the dark lateral band very distinct and traceable across eye to tip of snout.

In spirits the bright colors disappear, the upper parts are darker than the lower, the dusky color ending abruptly along a dark lateral stripe, or if the stripe is wanting the dark color disappears gradually; each scale with a central light spot, a dark spot sometimes present on lateral line posterior to tip of pectoral; middle of caudal dusky.

Here described from specimens about 300 millimeters long obtained at Honolulu. This common and widely diffused species reaches the Riukiu Islands, a specimen before us having been taken at Nafa, in Okinawa. As this specimen is faded, only a trace of a pale lateral blotch being visible, we have drawn our account of the color from examples taken in Hilo, Hawaii, certainly of the same species. The colors vary greatly in life, some being largely yellow, others mostly olive green, often with green flesh and bones. The orange or black or brown lateral band varies much, being often broken into spots, or in old examples obsolete. Occasionally a pink blotch is seen behind the pectoral fins.

We have also a specimen from Formosa.

(*inermis*, unarmed.)

20. THALASSOMA Swainson.

Thalassoma SWAINSON, Nat. Hist. Classif. Fishes, II, 1839, p. 224 (*purpurea*).

Chlorichthys SWAINSON, Nat. Hist. Classif. Fishes, II, 1839, p. 232 (*bifasciatus*).

Julis GÜNTHER, Cat. Fish., IV, 1862, p. 179 (*pavo*), not of Cuvier, Règne Anim., 1st ed., 1817, p. 261, type, *julis*.

Body oblong or elongate, moderately compressed, covered with large scales; lateral line continuous; head scaleless; a slight sheath of scales along base of dorsal; no posterior canine; dorsal spines slender, the number always eight; anal spines three, the first very small. Lower pharyngeals essentially as in *Halichares*. Beautiful fishes of the coral reefs and warm currents, the coloration largely deep green or blue.

(θάλλος, a green branch: σῶμα, body, from the green coloration of the typical species.)

- a. Caudal truncate, the lobes not produced; pectoral dusky at tip; color dark bluish green, with two black lateral shades and other markings; head with red stripes radiating from eye; fins largely red..... *cupido*, 35.
- aa. Caudal lunate, with the angles produced.
- b. Back without dark cross bars; traces of oblique bands below pectoral; pectoral with a large black blotch at tip; head with dark stripes..... *lutescens*, 36.
- bb. Back with 6 black cross bars; head with radiating red bands; pectoral without distinct dark spot; body and fins more or less variegated..... *dorsale*, 37.

35. THALASSOMA CUPIDO (Schlegel).

NISHIKIUWO (BROCADE-FISH).

Julis cupido SCHLEGEL, Fauna Japonica Poiss., 1846, p. 170, pl. LXXXVI bis, fig. 3; Nagasaki.—BLEEKER, Verh. Bot. Gen., XXI, Labr., p. 30.—? GÜNTHER, Cat. Fish., IV, 1862, p. 181; Batavia, probably not of Schlegel.—BLEEKER, Alt. Ichth., p. 39, pl. XXXIII, fig. 1.—STEINDACHNER and DÖDERLEIN, Fische Japans, IV, 1887, p. 20; Tokyo.

Thalassoma cupido JORDAN and SNYDER, Check List, 1901, p. 88.

Julis quadricolor BREVOORT, Exped. Japan, 1856, p. 272, pl. VIII, fig. 2; Shimoda, not *Julis quadricolor* of Lesson.

Thalassoma quadricolor JORDAN and SNYDER, Check List, 1901, p. 88; after Brevoort.

Head $3\frac{1}{2}$ in length; depth $3\frac{1}{2}$; depth of caudal peduncle $1\frac{2}{3}$; eye 6 in head; interorbital space $3\frac{2}{3}$; snout $2\frac{2}{3}$; D. VIII, 13; A. III, 11; scales in lateral series 25; between lateral line and insertion of dorsal 2; between lateral line and insertion of anal 8.

Body elongate, caudal peduncle deep, the head short. Teeth in a single series, canine-like anteriorly, gradually growing shorter posteriorly; no posterior canines. Preopercle smooth; opercle with a flap, the posterior edge of which is concave; gill-membranes forming a narrow fold across isthmus. Gill-rakers on first arch 6+8, short, pointed, those near the limbs much reduced.

Head naked; dorsal and anal with just the suggestion of basal sheaths, scales of nape and breast not greatly reduced in size. Lateral line complete, abruptly bent downwards below base of soft dorsal.

Membrane of dorsal fin not incised, spines slender, low, the highest contained about $3\frac{1}{2}$ in head; longest ray $2\frac{1}{2}$. First anal spine minute, concealed in the thick membrane, more distinct in younger individuals, the third spine $3\frac{1}{2}$ in head; longest ray $3\frac{1}{2}$. Caudal, truncated or slightly rounded posteriorly, $1\frac{1}{3}$ in head. Pectoral large, the upper rays slightly longer than caudal fin. Ventrals very small, without filaments, $2\frac{1}{2}$ in head.

Color in spirits dark bluish green, a black band running from snout to end of dorsal fin, a lighter dusky band from snout to base of caudal, a short light yellowish band along side on a level with lower part of base of pectoral; scale of dark parts with darker spots, of light parts with lighter spots; dorsal and anal with a blackish band along bases, middle of caudal brownish black, pectoral broadly tipped with black, a small black spot on upper part of its base.

Color in life; upper half of body dark green with brick-red reticulations, lower part indigo, a flesh-colored band extending backward from lower part of pectoral; head light greenish olive; caudal greenish blue with large, blackish, brick-red blotch; pectoral bluish with the tip washed with blackish; with flesh-colored spot at base; ventrals indigo. Described from a specimen about 200 millimeters long from Nagasaki.

This most beautiful little fish is common in rock pools off the headlands of Japan. We have many specimens from Tokyo, Misaki, and Nagasaki.

(*Cupido*, the god of Love.)

36. *THALASSOMA LUTESCENS* (Solander).

? *Labrus lunaris* LINNÆUS, Syst. Nat., 10th ed., p. 283, India; 12th ed., p. 474, and of the copyists.

? *Julis lunaris* CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 409; Masuah, Siam.—RICHARDSON, Ichth. China, 1846, p. 260; Canton.—BLEEKER, Atlas Ichth., p. 90, pl. XXXIII, fig. 5, etc.—GÜNTHER, Cat. Fish., IV, 1862, p. 180; Mozambique, Ceylon, Amboyna, Moluccas, Hongkong, Celebes.—? DAY, Fish India, 1885, p. 403; Andamans.

? *Scarus gallus* FORSKÅL, Decr. Anim., 1775, p. 26; Red Sea.

? *Labrus zeylanicus* (Forster) PENNANT, Indian Zoology, 1790, p. 56, pl. XVI; Ceylon.

Labrus viridis BLOCH, Ichthyologia, V, 1785, p. 129, pl. CCLXXXII; Japan.—SCHNEIDER, Syst. Ichth., 1801, p. 246.—LACÉPÈDE, Hist. Nat. Poiss., III, 1801, pp. 354, 520, after Bloch. (Not *Labrus viridis* of Linnæus.)

Julis viridis CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 420; Bourbon Island.

? *Julis porphyrocephala* BENNETT, Proc. Comm. Zool. Soc., II, 1830, p. 183.

? *Julis hardwickei* GRAY, Ind. Zool. Pisc., 1830, pl. IX, fig. 1; India.

? *Julis meniscus* CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 415; Seychellas, Macao.

Julis mertensi CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 421; Ulea.

Labrus lutescens SOLANDER Ms.; Tahiti.

Julis lutescens BENNETT, Zool. Beechey's Voy. Blossom, Fishes, 1839, p. 65, pl. XIX, fig. 2; Tahiti, Riukiu: after Solander.—BREVOORT, Exped. Japan, Fishes, 1856, p. 271, pl. VIII, figs. 3, 4; Nafa, Okinawa Island.

? *Julis celebicus* BLEEKER, Celebes, VIII, 1855, p. 313; Celebes.

Head $3\frac{3}{4}$ in length; depth $3\frac{3}{8}$; depth of caudal peduncle $6\frac{3}{8}$; eye $5\frac{1}{4}$ in head; interorbital space 4; snout $2\frac{3}{4}$; D. VIII, 13; A. III, 11; scales in lateral series 24; between lateral line and insertion of dorsal 2; between lateral line and insertion of anal 8.

Body compressed, caudal peduncle deep, dorsal outline evenly curved. Teeth in a single row, canine-like in front, growing successively short posteriorly; no posterior canines. Preopercle smooth; opercle with a small rounded flap. Gill rakers on first arch 5+10, short, slender, pointed.

Head naked, dorsal and anal with a very narrow sheath, scales on nape and breast not greatly reduced in size. Lateral line complete, abruptly bent downward below base of soft dorsal. Membrane of

dorsal not incised, spines rather strong, the longest contained $3\frac{1}{2}$ times in head; longest ray $2\frac{1}{4}$. First anal ray short, very slender, closely apposed to second and hidden beneath the membrane, the third spine $3\frac{1}{4}$ in head, longest ray $2\frac{1}{4}$. Caudal truncate, the upper and lower rays filamentous, middle rays $1\frac{1}{2}$ in head. Upper rays of pectoral somewhat longer than caudal. Anal short.

In spirits the body is light brownish yellow, head bluish white with darker bands; dorsal with a dark spot on membrane following first and second spines, dorsal and anal with a basal band of brownish; pectoral with a large, elongate, brownish spot extending from tip downward toward middle of lower rays, a small black spot on upper edge of axil; a trace of two oblique green bands below the pectoral fin.

Of this species we have a single specimen from Nafa in Okinawa. It agrees fairly with the original figures of *Labrus viridis* and the two figures of *Julis lutescens*, that of Bloch and that of Brevoort being drawn from specimens presumably taken at Nafa, the capital of the Riukiu Islands or Okinawa province. These figures have been placed in the synonymy of the widely diffused *Thalassoma lunare*, but our specimen does not correspond to accounts of that species and it is certain that widely different forms (as *Thalassoma duperreyi* and *verticalis*) have been included under the name of *lunaris*. The name *Labrus viridis* being preoccupied, we adopt the next name in point of date of which we feel sure.

(*lutescens*, growing yellow.)

37. THALASSOMA DORSALE (Quoy and Gaimard).

Julis dorsalis QUOY and GAIMARD, Voy. Astrolabe, Poiss., 1834, p. 713, pl. xv, fig. 5; Ile de France.—CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 449; Ile de France.—BLEEKER, Amboyna, II, p. 564, Amboyna; Alt. Ichth., 1862, p. 94, pl. xxxiv, fig. 4; Java, Sumatra, Bawean, Celebes, Flores, Amboyna, Banda, New Guinea, etc.—GÜNTHER, Cat. Fish., IV, 1862, p. 190; Philippines, Hongkong, Aneitum, Fiji, Ceylon, Mozambique.—ISHIKAWA, Prel. Cat., 1897, p. 28; Riukiu Islands.

Sparus hardwickei BENNETT, Fishes of Ceylon, 1837-1841, pl. xii; Ceylon (not *Julis hardwickei* Gray).

Julis semifasciatus CUVIER and VALENCIENNES, Hist. Poiss., XIII, 1837, p. 448; Ile de France.

Julis urostigma BLEEKER, Sumatra, II, p. 287; Sumatra.

D. VIII, 13; A. III, 11; scales in lateral line 29; in transverse series $3 + 9$.

The height of the body equals the length of the head, and is rather more than one-fourth of the total. Caudal with the lobes more or less produced; ventral pointed. Back with six black crossbars, which sometimes extend on the dorsal fin; generally a black longitudinal band on the dorsal; a red band along the side of the tail; head with broad red bands radiating from the eye; anal fin with a more or less

distinct black spot anteriorly, without longitudinal band; a black spot superiorly in the axil (Günther). No distinct black blotch on tip of pectoral.

Of this species a single specimen is in the Imperial Museum of Tokyo, from the Riukiu Islands.

(*dorsalis*, pertaining to the back.)

21. GOMPHOSUS Lacépède.

Gomphosus LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 100 (*cæruleus*).

Body rather elongate, compressed, covered with moderate-sized scales, 25 to 30 in the lateral line; lateral line not interrupted; head scaleless; snout abruptly produced, a long tube, which bears the rather long jaws at the end; canines small; no posterior canine; gill membranes attached to the isthmus: fin rays; Dorsal VIII, 13; Anal III or II, 11. Small fishes of brilliant colors, allied to *Thalassoma*, but distinguished from all other *Labridæ* by the prolonged snout. East India and Polynesia.

(*γόμφος*, a nail.)

a. Color deep blue or bluish green with a yellow bar behind pectoral. *tricolor*, 38.

aa. Color gray with black spots, anteriorly rosy, posteriorly blackish; no blue anywhere. *varius*, 39.

38. GOMPHOSUS TRICOLOR (Quoy and Gaimard).

Gomphosus tricolor QUOY and GAIMARD, Voy. Uranie, Zool., 1824, p. 280, pl. IV, fig. 2; Maui (Sandwich Islands).—BLEEKER, Act. Soc. Indo-Nederl., I, Manado and Macassar, p. 54; Manado (Celebes); Atlas Ichth., 1862, p. 85, pl. XXI, fig. 6; Celebes, Sumatra, Amboyna.

Gomphosus cepedianus CUVIER and VALENCIENNES, Hist. Nat. Poiss., XIV, 1839, p. 19; Maui (after Quoy's types), Tahiti, Carolines.

Head $2\frac{3}{4}$ in length; depth $3\frac{1}{2}$; depth of caudal peduncle $9\frac{1}{4}$; eye $9\frac{1}{4}$ in head; interorbital space $6\frac{1}{2}$; snout $1\frac{1}{2}$; D. VIII, 13; A. III, 11; scales in lateral series 25; between lateral line and insertion of dorsal 3; between lateral line and insertion of anal 8.

Snout notably long and pointed, the jaws greatly produced and very protractile; mouth wide, the cleft $3\frac{2}{3}$ in head. Teeth in a single row, minute, blunt, and close set posteriorly, appearing like a serrated ridge, longer anteriorly, the ones at tips of jaws canine-like; no posterior canines. Preopercle smooth. Gill membranes forming a narrow fold across isthmus. Gill rakers on first arch 8+16, short, pointed.

Head naked, dorsal fin with a slight sheath, scales of nape and breast small but not notably reduced. Lateral line abruptly bent downward below soft dorsal fin.

Membrane of dorsal not incised, spines short, the longest about equal to diameter of eye, rays about twice as long. First anal spine very minute, often completely hidden in the membrane, third spine

slightly longer than diameter of eye, the rays somewhat higher than those of the dorsal. Caudal truncate or slightly concave, $2\frac{1}{4}$ in head. Pectoral $2\frac{1}{4}$ in head. Ventrals small. Described from a specimen about 225 millimeters long.

Color in life, from specimens collected at Honolulu, Hawaii, indigo blue with a greenish shade, becoming distinctly green on back and belly; edge of each scale dull violet, the violet shades continuous on belly, restricted on back to a brownish-red spot on each scale, the form and shade of the violet markings varying considerably. Head green above, deep blue on cheek and opercles, light blue on jaws, indigo-blue throat, elsewhere with varying shades of greenish and dark purple, light red streaks radiating from eye. A bright, yellowish-green bar behind gill-opening covering basal fourth of pectoral fin; a jet black spot on base of first rays of pectoral; dorsal reddish brown at base, then bright blue, the upper part golden green; the anal similar to dorsal; caudal bright bluish green, its scaly base dull violet; ventrals dull blue, outer rays black; pectoral golden green at base, otherwise pale violet washed with blackish above; iris green with a scarlet ring.

Of this species we have two large specimens from Nafa, in Okinawa. We can not see that they differ from others from Hawaii. The species is very widely distributed and in life it is brilliantly colored.

(*tricolor*, three-colored.)

39. GOMPHOSUS VARIUS Lacépède.

?*Gomphosus varius* LACÉPÈDE, Hist. Nat. Poiss., III, 1801, p. 104, pl. v, fig. 2; Ile de France (described as variegated with red, blue, and golden).—GÜNTHER, Cat. Fish., IV, 1862, p. 193; Aneitum, Tahiti.—ISHIKAWA, Prel. Cat., 1897, p. 28; Miyakoshima, Riukiu Islands.

Gomphosus pectoralis QUOY and GAIMARD, Voy. Uranie, Zool., 1824, p. 282; Maui (Hawaii).—DAY, Fish. India, about 1885, p. 406, pl. LXXXVI, fig. 6; Andamans.—BENNETT, Fish. Ceylon, 1830, p. 3, pl. III; Ceylon (anal with a yellowish cross-band).

Gomphosus fuscus CUVIER and VALENCIENNES, Hist. Poiss., XIV, 1839, p. 23; Maui.—BREVOORT, Exped. Japan, 1856, p. 272; Riukiu.

Gomphosus melanotus BLEEKER, Kokos, p. 457; Kokos; Atlas Ichth., I, 1862, p. 87, pl. XXI, fig. 3; Kokos, Java.—GÜNTHER, Cat. Fish., IV, 1862, p. 193; East Indies.

Head $2\frac{3}{5}$ in length; depth $3\frac{1}{4}$; depth of caudal peduncle $2\frac{1}{4}$; eye $6\frac{1}{5}$ in head; snout $1\frac{3}{4}$; interorbital space $6\frac{1}{5}$; D. VIII, 13; A. III, 11; scales in lateral series 25; between lateral line and insertion of dorsal 3; between lateral line and insertion of anal 8.

This species is very like *G. tricolor* except in coloration, it having none of the brilliant hues of that species.

Color gray, or grayish brown, the lower anterior parts suffused with rose color, the body growing almost black posteriorly; scales of upper parts, each with a brownish-black bar, represented on sides of belly by

a round or elongate spot; 2 dark bands radiating from posterior part of orbit, an indistinct bar extending forward from eye; dorsal dark like back, very narrowly edged with white; anal dark with a round, white spot between each ray, the spots growing smaller posteriorly, fin narrowly edged with white; caudal black with a white edge about as wide as diameter of pupil; pectoral plain, a small spot on upper edge of axil; outer rays of ventrals blackish.

Of this species we have examined one specimen in the Imperial Fisheries Institute of Japan, taken at Kagoshima in Kiusiu. It occurs in Riukiu and we have many specimens from the Hawaiian Islands.

(*varius*, varied.)

22. CIRRHILABRUS Schlegel.

Cirrhilabrus SCHLEGEL Fauna Japonica, Poiss., 1846, p. 167 (*temmincki*).

Cheilinoidea BLEEKER, Natuurk. Nederl. Ind., II, 1851, p. 71 (*cyanopleura*).

Body compressed, oblong, covered with large scales, 20 to 25 in the lateral line; lateral line interrupted; forehead not elevated nor trunchant; cheeks and opercles with imbricated scales; preopercle serrated; teeth in one series, with canines anteriorly; no posterior canine. D. XI, 9; A. III, 9. Ventrals much produced (*Cirrhilabrus*) or short (*Cheilinoidea*).

Small fishes, brilliantly colored, of the East Indian seas.

(*cirrus*, a filament; *labrus*; from the long ventrals.)

40. CIRRHILABRUS TEMMINCKI (Bleeker).

Cirrhilabrus SCHLEGEL Fauna Japonica, Poiss., 1846, p. 167; Nagasaki.

Cirrhilabrus temmincki BLEEKER, Verh. Bat. Gen., XXV, Japan, 1852, p. 17; Nagasaki.—GÜNTHER, Cat. Fish., IV, 1862, p. 124, after Schlegel.

Head $3\frac{2}{3}$ in length; depth 3; depth of caudal peduncle 2; eye $4\frac{1}{2}$ in head; snout $3\frac{2}{3}$; interorbital space $3\frac{1}{2}$; D. XI, 9; A. III, 9; scales in lateral series 23; between lateral line and insertion of dorsal 2; between lateral line and insertion of anal 7; 2 rows on cheek.

Body notably compressed; the caudal peduncle short and deep; forehead low, broad, the interorbital area slightly convex; dorsal outline somewhat elevated above pectorals. Snout short, sharp, jaws equal, lips very thin. Teeth in a single row laterally, very small; an outer row represented by 6 strong canines on the upper jaw and 2 on the lower; of the upper canines the middle pair are smallest and project forward, the others are larger, fang-like, and strongly curved backward; no posterior canines present. Gill-rakers short, pointed. Edge of preopercle finely serrated. Scales on opercle large, imbricate; on body large, those on breast not greatly reduced; a row of very large pointed scales forming a basal sheath on dorsal and anal; caudal with a conspicuous basal sheath, the 3 posterior scales elongate and greatly enlarged, a slender, pointed scale above base of ventral. Lateral

line incomplete, extending along upper part of body, parallel with back, ending below base of sixth or seventh dorsal ray, beginning again on the third row of scales below and extending along middle of caudal peduncle. Membrane of dorsal not incised, spines slender, the longest $2\frac{1}{2}$ in head. Posterior rays longest, $1\frac{1}{2}$ in head. First anal spine short, not concealed, the third contained 4 times in head, last rays slightly longer than those of dorsal. Caudal rounded posteriorly, somewhat shorter than head. Pectorals about $1\frac{1}{2}$ in head. Ventrals falcate, extremely long, reaching beyond posterior end of anal base.

Color in spirits brownish, each scale with a lighter edging, a yellowish white area extending from snout above lateral line to base of caudal fin, a narrow branch of same extending from snout below eye to edge of opercle, a narrow median band of the body color from snout to origin of spinous dorsal; an indistinct, narrow, zigzag band with a round, pearly white spot on each angle, along middle of pos-

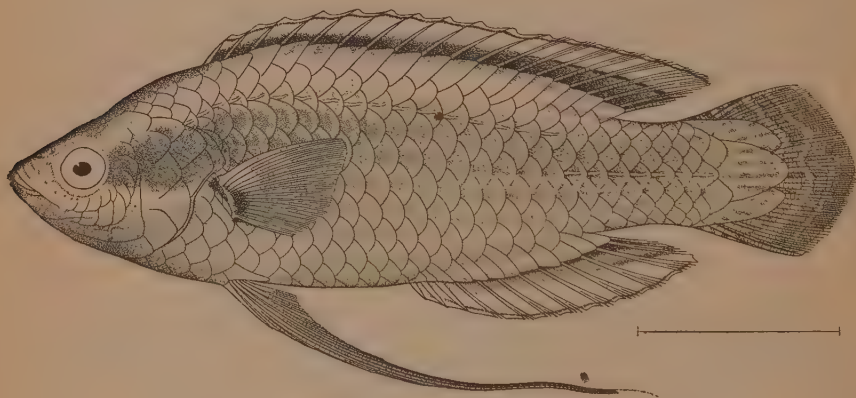


FIG. 10.—*CIRRHILABRUS TEMMINCKII*.

terior half of body; a longitudinal dark band on dorsal and anal at outer edge of basal sheath, a subterminal black line along edges of fins; caudal dusky with vertical, wavy bands of pale pearly white; an indistinct dusky blotch at base of pectoral.

A male specimen about 100 millimeters long is described above. The coloration of the females is plainer, a row of small pearly spots extending along body above lateral line, the lower parts of body light; dorsal and anal with dark band present, though not conspicuous, the subterminal line absent, caudal plain, the pectoral with a very indistinct dusky blotch at base. The ventrals are filamentous, though not reaching anal opening.

Color in life.—Back crimson in males, side of head crimson except a pearly area behind eye, lower half of body abruptly pearly blue, middle of breast deep blue, belly grayish. Dorsal and anal crimson, the base blackish blue; caudal blue, pectoral pale grayish, ventral bluish gray, base of ventral with a bluish cross streak.

This surpassingly beautiful little fish is rather rare about rocky

headlands in Japan. Our specimens, six in number, are from Wakanoura. The very long ventrals at once distinguish it from all other Japanese labroids.

(Named for Prof. C. J. Temminck, of Leyden.)

23. CHEILINUS Lacépède.

Cheilinus LACÉPÈDE, Hist. Nat. Poiss., III, 1802, p. 529 (*trilobatus*).

Urichthys SWAINSON, Nat. Hist. Fishes, II, 1839, p. 224 (*lunulatus*).

Crassilabrus SWAINSON, Nat. Hist. Fishes, II, 1839, p. 225 (*undulatus*).

Thallurus SWAINSON, Nat. Hist. Fishes, II, 1839, p. 230 (*blochi-chlorurus*).

Oxycheilinus GILL, Proc. Ac. Nat. Sci. Phila., 1862, p. 143 (*arenatus*).

Body oblong, compressed, covered with large scales, 20 to 25 in lateral line; lateral line interrupted; cheeks with two series of large scales; opercles scaly; preopercle entire; teeth in one series, two canines in front of each jaw, not bent backward nor outward; no posterior canine; lower jaw not produced backward; lips thick; dorsal spines subequal. Dorsal IX, 10 (rarely X, 9); anal III, 8. Fishes of Polynesia and the East Indies, usually brightly colored, the shades chiefly red and green.

(χεῖλος, lip.)

41. CHEILINUS OXYRHYNCHUS Bleeker.

MOCHINOUWO (RICE-BALL-FISH).

Cheilinus oxyrhynchus BLEEKER, Atlas Ichth., 1862, p. 73, pl. XXVIII, fig. 2; Celebes, Amboyna, Batjan.—GÜNTHER, Cat. Fish., IV, 1862, p. 133; East Indies.

Cheilinus sp., No. 514 (*Mochinouwo*) ISHIKAWA, Prel. Cat., 1897, p. 29; Riukiu Archipelago.

Head $1\frac{3}{8}$ in length; depth $3\frac{2}{3}$; depth of caudal peduncle 7; eye 5 in head; interorbital space $5\frac{1}{2}$; snout $2\frac{2}{3}$; D. IX, 10; A. III, 8; scales in lateral series 20; between lateral line and insertion of dorsal 2; between lateral line and insertion of anal 6; 2 rows on cheek.

Body compressed, caudal peduncle deep; head large, pointed; contour from snout to dorsal almost straight; snout large, mouth wide; lower jaw slightly projecting, lips thick, maxillary broad and heavy. Teeth in a single row, large, obtusely pointed, 2 strong, straight, widely separated canines in each jaw, 2 or 3 rudimentary canines between the upper pair, no posterior canines. Edge of preopercle serrate. Gill-rakers on first arch 5+8, long, compressed, pointed, widely spaced. Scales of body large, not reduced in size on nape and breast; a narrow basal shield of pointed scales on base of caudal enlarged; imbricate scales on opercle. Lateral line interrupted, extending in a straight line to a point below end of base of caudal, beginning again on the second row of scales below, 3 scales in advance of where it ended, and extending along middle of caudal peduncle. Dorsal spines rather strong, growing larger posteriorly, the longest $3\frac{2}{3}$ in head, longest ray 3 in head. First anal spine large, close to the second, the third longest,

3 in head, rays slightly longer; fin membranes very thin and transparent, notched between the spines. Caudal rounded, its length $1\frac{2}{3}$ in head. Ventrals reaching half-way between their base and insertion of anal. Upper rays of pectoral longest, $2\frac{1}{2}$ in head.

Color in spirits plain throughout, except a small brownish blotch at base of anterior part of spinous dorsal and across basal half of ventrals.

According to Günther and Bleeker the body is yellowish olive, the snout unmarked, reticulated brown lines on hinder half of head, on body, and on soft parts of vertical fins; subopercle covered by several brown lines; two irregular blackish blotches on tail; dorsal with a blackish spot between first and second spines.

Of this species we have an example, very badly faded, from the Riukiu Islands, one of three numbered 514 in the Imperial Museum at Tokyo. Only the dark spot on front of dorsal and a dark shade across ventrals remain of its original coloration. It agrees in form with *oxyrhynchus* of Bleeker, and without much doubt belongs to that species.

(ὄξύς, sharp; ρύγχυς, snout).

24. INIISTIUS GILL.

Iniistius GILL, Proc. Ac. Nat. Sci. Phila., 1862, p. 143 (*pavo*).

Xyrichthys BLEEKER, Atlas Ichth., 1862, p. 149 (*pavo*), not of Cuvier.

Body compressed, oblong, covered with large thin scales, about 26 in the lateral line; head scaleless or very nearly so; head short and deep, the upper and anterior outline compressed to a sharp edge; profile almost vertical; eye small, placed high. Dorsal spines 9; the fin rays, D. II, 7, 12; A. III, 12; first two dorsal spines detached from the others and inserted on or close behind the occiput; lateral line interrupted, extending on the second row of large scales below the dorsal sheath; canines 2 in front of each jaw; no posterior canines. This genus contains some 5 or 6 species, chiefly of the western Pacific. They are similar in most respects to the species of *Xyrichthys*, differing chiefly in having the two anterior spines of the dorsal fin produced, separated from the others, and placed as a separate fin on the nape.

(*iviov*, nape; *ιστίον*, sail; in allusion to the first dorsal fin on the nape.)

42. INIISTIUS DEA (Schlegel).

TEISU (HUSBAND); CHIDAI (BROAD PERCH); BENI KUSABÉ (RED WEDGE FISH).

Xyrichthys dea SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 171, pl. LXXXVII; Nagasaki.

Novacula dea BLEEKER, Act. Soc. Sci. Indo-Nederl., III, Japan. IV, p. 20; Nagasaki.—GÜNTHER, Cat. Fish., IV, 1862, p. 175; Nagasaki.—STEINDACHNER, Fische Japans, IV, 1887, p. 20; Tokyo, Kochi.—KAROLI, Prodr. Pisc.

Asiæ. Orient., 1882, p. 29; Yokohama.—ISHIKAWA, Prel. Cat., 1897, p. 28; Boshu.

Iniistius *dea* JORDAN and SNYDER, Check List, 1901, p. 88; Yokohama.

Xyrichtys puniceus RICHARDSON, Ichth. China, 1846, p. 261; Canton.

Head $3\frac{3}{8}$ in length; depth $2\frac{1}{2}$; depth of caudal peduncle $1\frac{3}{4}$; eye $6\frac{1}{2}$ in head; interorbital space $5\frac{1}{2}$; snout measured from eye to tip of jaw $1\frac{2}{3}$; D. II, VII, 12; A. III, 11; scales in lateral series 23; between lateral line and dorsal fin 2; between lateral line and insertion of anal 10.

Body deep, compressed, caudal peduncle deep, dorsal contour elevated, anterior profile almost vertical, ventral contour evenly and gently curved. Eye small, high in head, near occiput, the suborbital area very broad, a narrow, cutaneous flap above and below eye. Snout blunt with a sharp ridge anteriorly. Mouth horizontal, a shallow furrow extending backward from the angle, lower lip narrow, thin, pendent, jaws equal. Teeth in a single row in each jaw, short, pointed, not coalesced at bases, 2 strong, curved canines at tip of each jaw, no posterior canines. Preopercle entire; opercle with a broad flap. Gill-rakers on first arch 6+10, those near ends very small; the middle ones rather thick, pointed. Head naked, scales slightly smaller on breast, not reduced in size on nape, dorsal and anal without basal sheath, small scales on base of caudal fin. Lateral line sharply curved anteriorly, interrupted below base of anal fin. Two anterior spines of dorsal united together by an incised membrane, separated in the following ones by an interspace, the first spine filamentous, somewhat higher than length of head; spines slender, 10 to 12 in second series, about $2\frac{1}{4}$ in head. Anal spines very slender, the rays a little shorter than those of the dorsal. Caudal rounded, $1\frac{1}{2}$ in head. Outer rays of ventrals filamentous, reaching a little beyond first anal spine.

Color in spirits, yellowish, dusky along back; pearly white spots or blotches on 1 or 2 rows of scales below base of dorsal; a deep black spot on the scale above the sixth or seventh one of the lateral line; dorsal fin with bluish or dusky reticulations; anal with a pearly blue band along the base and an indistinct dusky line along the middle; caudal with 3 faint vertical stripes; pectorals and ventrals with traces of pearly blue.

Color in life: Crimson, middle line of head bright sky blue, black spot of side bordered with blue; dorsal violet with crimson edges, anal blue at base, the outer parts dull orange, caudal crimson, pectorals pink, ventrals dull red.

Here described from specimens about 250 millimeters long.

This large and beautiful species is rather common in southern Japan, occurring about rocks. Our specimens are from Tokio, Misaki, Wakanoura, and Nagasaki.

The two sexes are similar in color, but in one male specimen the lateral spot is obsolete.

(*Dea*, a goddess.)

Family III. SCARIDÆ.

THE PARROT FISHES.

Body oblong, moderately compressed, covered with large cycloid scales as in the Labridæ. Mouth moderate, terminal. Teeth in the jaws more or less coalescent, at least at base; lower pharyngeals much enlarged, united in a concave or spoon-shaped body, their teeth broadest transversely and truncate, arranged in mosaic; dorsal continuous, its formula usually IX, 10; anal rays II, 9; 23 to 25 scales in the lateral line; vertebræ about $11+14=25$. Sexes similarly colored, the coloration almost always brilliant; fin rays essentially the same throughout the group, the squamation varying little except on the head. Species of the tropical seas, especially abundant about coral reefs. Herbivorous fishes, often of large size, not valued as food, the flesh being soft and pasty. The species in the various genera are very closely related, being distinguished chiefly by the coloration and the dentition, both series of characters being highly specialized. We begin the group with the most generalized genus, the one nearest the Labroid ancestors of the *Scaridæ*.

SPARISOMATINÆ:

- a. Lower pharyngeal broader than long, flattish or basin-shaped; gill membranes broadly joined to the isthmus, not forming a fold across it; lateral line sub-continuous; scales about head few and large, those on the cheek in 1 row; lower jaw projecting; teeth whitish or rosy.
- b. Dorsal spines flexible; teeth more or less distinct, at least anteriorly.
- c. Teeth in each jaw in 3 or 4 series, all imbricated in quincunx order on the dental plate, to which they are adnate by the posterior face; cutting edge of each jaw formed by teeth.....*Calotomus*, 25.

SCARINÆ:

- iii. Lower pharyngeal spoon-shaped, much longer than broad; teeth of jaws fully coalesced, each jaw divided by a distinct median suture; gill membranes forming a fold across the isthmus; dorsal spines flexible; lateral line interrupted behind, beginning again lower down on the peduncle of the tail; scales about head rather numerous, those on cheeks in 2 or more series.

Scarus, 26.

25. CALOTOMUS Gilbert.

Calotomus GILBERT, Proc. U. S. Nat. Mus., 1890, p. 70 (*xenodon*).

Teeth distinct, equal, imbricated in regular oblique rows in both jaws, wholly concealing the dental plates, to the anterior edge of which they are affixed. Cutting edge of each jaw formed by the outer teeth, the dental plate not reaching the edge, and visible only from within. Lips double for a short distance only. Scales of cheek in one row; lateral line continuous; bases of dorsal and anal with scaly sheaths; dorsal spines 9, soft and flexible; gill membranes broadly joined to the isthmus. Large species of the Pacific, allied to *Cryptotomus* (*Callyo-*

don Cuvier and Valenciennes, not *Calliodon* Bloch and Schneider), but differing in the arrangement of the teeth.

(καλός, beautiful; τομός, cutting.)

43. CALOTOMUS JAPONICUS (Cuvier and Valenciennes).

BUDAI; IGAMI.

Calliodon japonicus CUVIER and VALENCIENNES, Hist. Poiss., XIV, 1839, p. 294, pl. cccvii; Japan, Coll. Langsdorff.—SCHLEGEL, Fauna Japonica, Poiss., 1846, p. 174, pl. lcccix, Nagasaki.—BLEEKER, Verh. Bat. Gen., XXVI, Nalez, Japan, p. 115; Nagasaki.—GÜNTHER, Cat. Fish., IV, 1862, p. 215; Nagasaki.—KAROLI, Prodr. Pisc. As. Or., 1882, p. 29; Yokohama, Kobe.—STEINDACHNER and DÖDERLEIN, Fische Japans., IV, 1887, p. 21: Tokyo.—ISHIKAWA, Prel. Cat., 1897, p. 28; Tokyo, Osaka, Riukiu Islands.

Calliodon rubiginosus CUVIER, Règne Anim. III. Poiss., pl. xci, fig. 2.

Head $3\frac{1}{2}$ in length; depth $2\frac{1}{3}$; depth of caudal peduncle 7; eye $4\frac{1}{2}$; snout $2\frac{1}{3}$; interorbital space $3\frac{1}{2}$; D. IX + 10; A. III, 9; scales in lateral series 21; between lateral line and insertion of dorsal 2; between lateral line and insertion of anal 6.

Body deep, heavy; caudal peduncle narrow, subcylindrical. Head short, rather blunt, interorbital space convex or flattish; jaws equal; lips double posteriorly. Teeth about equal in size, separate, the tips and edges free, those in anterior half of jaws arranged in series of oblique rows, 4 or 5 in a row; upper jaws with 3 or 4 large, curved, conical teeth just posterior to the oblique rows; posterior half of jaws with a single row of teeth, those above very small, those below as large as the front teeth. Gill-rakers on first arch 10 or 12, rather stumpy, pointed. Angle of preopercle with a large thin flap. Opercle with a large soft flap. Scales on cheeks in a single row of 4, those on opercle large; 4 scales deeply notched posteriorly, between occiput and first dorsal spine, a row of narrow scales forming a sheath along base of dorsal, very large scales on base of caudal. Lateral line complete, abruptly bend downwards below base of soft dorsal. Dorsal spines high, slender, with soft tips, the longest $2\frac{1}{6}$ in head, longest ray $1\frac{1}{2}$. Anal spines weak, longest ray $2\frac{1}{3}$ in head. Caudal rounded, $1\frac{1}{2}$ in head. Ventrals reaching half way between their base and first anal ray. Pectoral $1\frac{1}{4}$ in head.

Color olive-brown, belly olive-green and brick-red, chin plain or clouded with vitriol-green, the amount of red and green extremely variable. In spirits the bright colors nearly all disappear.

This species is rather common in Japan and reaches a considerable size. It is subject to considerable variation in color, especially in the amount of reddish and greenish shading. It lives in rocky places in shallow water and was taken by us at Tokyo, Yokohama, Misaki, Wakanoura, and Nagasaki.

26. SCARUS Forškål.

- Callyodon* GRONOW, Museum Ichthyol., II, 1764, p. 8 (*croicensis*), nonbinomial.
Scarus FORSKÅL, Descr. Animal, etc., in Orient Observ., 1775, p. 25 (*psittacus*, etc.); not of Gronow, 1764, which (nonbinomial) = *Labrus* Linnæus.
Calliodon BLOCH and SCHNEIDER, Syst. Ichthyol., 1801, p. 312 (*lineatus* = *croicensis*).
Hemistoma SWAINSON, Class'n Fishes, etc., II, 1839, p. 226 (*reticulatus* Swainson = *pepo* Bennett) (= *Scarus*).
Petronason SWAINSON, Class'n Fishes, etc., II, 1839, p. 226 (*psittacus*) (= *Scarus*).
Erychthys SWAINSON, Class'n Fishes, etc., II, 1839, p. 226 (*croicensis*).
Chlorurus SWAINSON, Class'n Fishes, etc., II, 1839, p. 227 (*gibbus*) (= *Scarus*).
Callyodon GRONOW, Systema, Ed. Gray, 1854, p. 83 (*lineatus*, etc.).
Pseudoscarus BLEEKER, Vet. Acad. Wet. Amst. Scar., XII, 1861, p. 3 (*microrhinos*) (teeth blue; posterior canine present).
Scarus JORDAN and GILBERT, Synopsis, 1883, p. 938 (*psittacus*).
Calliodon JORDAN, Proc. U. S. Nat. Mus., 1886, p. 591 (*croicensis*).
Loro JORDAN and EVERMANN, Check List, Fish North Am., 1896, p. 418, (*guacamaia*) (teeth blue; no posterior canines).

Lower pharyngeals spoon-shaped, ovate-oblong, transversely concave; teeth in each jaw fully coalescent, appearing as tessellations on the surface; jaws with distinct median suture; the edges of jaw even, the teeth whitish, rosy, or green in color. Upper pharyngeals each with 2 rows of teeth; gill membranes scarcely united to the narrow isthmus, across which they form a broad fold; dorsal spines flexible, scarcely different from the soft rays; upper lip laterally double, the interior fold becoming very narrow or obsolete mesially; lower jaw included in the closed mouth; lateral line interrupted posteriorly, beginning again on the next series of scales below; tubes of lateral line scarcely branched; scales on cheek in 2 to 4 rows; scales in front of dorsal on median line 6 to 8. Dorsal rays IX, 10; anal III, 9 in all species; scales $\frac{1}{2}$ -24-6. Body robust. Species very numerous, mostly of large size, found in nearly all tropical seas.

This group naturally divides into two subgenera, *Scarus*, with pale teeth, and *Pseudoscarus*, with the teeth specialized and deep blue in color. Each group may be further divided as to the presence or absence of posterior canines, although these structures are often lost in the species normally possessing them.

(σκαῖρος, *Scarus*, ancient name of *Sparisoma cretense*, said by Rondelet to be from σκαίρω, to pasture.)

a. Teeth whitish or rosy gray.

b. *Scarus*. Upper jaw with one or two posterior canines.

c. Head with yellow streaks; a black ocellus at base of 4th dorsal spine; scales of side with white dots; fins with yellow streaks or markings; checks with $2\frac{1}{2}$ series of scales.....*globiceps*, 44.

aa. Teeth deep blue.

d. *Loro*. Upper jaw without canines; color dark gray; the fins chiefly deep blue and blackish; checks with 2 series of scales.....*ovifrons*, 45.

44. *SCARUS GLOBICEPS* Cuvier and Valenciennes.

Scarus globiceps CUVIER and VALENCIENNES, Hist. Poiss., XIV, 1839, p. 179; Tahiti.—JENYNS, Voyage Beagle. Fish., 1842, p. 106; Tahiti.

Pseudoscarus globiceps GÜNTHER, Cat. Fish., IV, 1862, p. 224; Tahiti.—STEINDACHNER and DÖDERLEIN, Fische Japans, IV, 1887, p. 21; Oshima, near Misaki.

This species is thus described by Günther from a specimen from Tahiti: Two series on scales on the cheek and one or two scales on the lower opercular limb; the middle series composed of six scales. Upper lip broad with the inner portion well developed; jaws whitish; a strong pointed horizontal tooth at the corner of the upper jaw, and a pair of similar teeth at the corner of the lower. Teeth of moderate size. Dorsal spines subequal in length, stout, with the top flexible; caudal emarginate; fourteen pectoral rays.

Greenish olive above, the lower parts of the head yellowish to an oblique line running from axil through the lower margin of the orbit and the upper lip. A curved yellow band passes from one eye across the snout to the other; short streaks radiate from the hinder and upper part of the orbit. * * * The dark colored portion of the head edged with yellow and dotted with whitish. Each scale of the body with four or five round whitish dots. A small black ocellus on the scale covering the base of the fourth dorsal spine. Dorsal fin yellowish, with two fine undulate violet lines, one along the base and the other near the margin; a series of acelli along the middle of the soft portion. Anal yellow, with a single line below the middle; caudal with a yellow, dark-edged band along each lobe; pectoral blackish at the root, and with an elongate-ovate dark spot on its upper half. (Günther.)

This species, unknown to us, is described by Steindachner from the outlying volcanic island of Oshima (Vries Island) off Misaki and Izu. (*globus*, globe; *ceps*, head.)

45. *SCARUS OVIFRONS*¹ Schlegel.

AOBUDAI (BLUE SCARUS).

Scarus ovifrons SCHLEGEL, Fauna Japonica, 1846, p. 173, pl. LCCCVII; Bay of Jeddo (Tokyo).

Pseudoscarus ovifrons STEINDACHNER and DÖDERLEIN, Fische Japans, IV, 1887, p. 21; Tokyo.—ISHIKAWA, Prel. Cat., 1897, p. 28; Tokyo.

Pseudoscarus schlegeli STEINDACHNER, Fische Japans, IV, 1887, p. 21; Tokyo.

Head $3\frac{1}{2}$ in length; depth $2\frac{5}{8}$; depth of caudal peduncle 7; eye 9 in head; interorbital space $2\frac{1}{2}$; snout 2; D. IX, 10; A. III, 9; scales in

¹ Karoli (Prodr. Pisc. As. Or., 1882, p. 29) records *Scarus lacerta* Cuvier and Valenciennes under the name of *Pseudoscarus æruginosus*, from Yokohama. This species is found in Formosa, but the Japanese locality is probably an error of identification, as are numerous others of the same author.

lateral series 23; between lateral line and insertion of dorsal 2; between lateral line and insertion of anal 7.

Body robust, the caudal peduncle rather narrow; head large, a fatty hump on upper part of snout; interorbital area high, convex; eye very small; midway between tip of snout and edge of opercular flap. Teeth completely coalesced, the cutting edge slightly serrated, a median division separating the jaws; lips thick, not closing far over the teeth, leaving a large exposed beak. Gill-rakers small, slender, very numerous and close together like the teeth of a comb. Scales on cheek in 2 rows, those on opercle large, in about 2 rows; a row of narrow scales about half as large as those of body along base of dorsal and anal fins, caudal with large scales on the base. Dorsal spines rather slender, the membrane notably thickened, especially about the outer parts of the spines; longest spine $2\frac{1}{4}$ in head; longest ray $2\frac{3}{8}$. Anal spines weak, their tips united in a thickened ridge of the membrane, the rays equal in height to those of the dorsal. Caudal truncate, the membrane thickened along the upper and lower edges, its length $1\frac{3}{8}$ in head. Pectoral equal to caudal in length. Ventrals extending two-thirds of distance between their bases and the vent, the membrane greatly thickened along the outer edges.

Color in alcohol, deep brownish olive; the scales broadly edged with a lighter shade which is largely blue in life. The teeth deep blue-green, growing whitish along the cutting edge; dorsal, caudal, and anal fins blackish, broadly edged with bright blue-green; pectorals plain blackish.

Of this great blue Parrot fish one large specimen was taken by us, at Nagasaki. It is evidently the original of Schlegel's figure, and Steindachner's description accords with it in almost every detail. The upper lip does not, however, nearly cover the upper jaw.

(*ovis*, sheep; *frons*, forehead.)

RECAPITULATION.

Family I. POMACENTRIDÆ.

1. *Amphiprion* Schneider.

1. *frenatus* Brevoort; Nafa, Shimoda
2. *polymnus* Linnæus.

2. *Chromis* Cuvier.

3. *notatus* (Schlegel); Tokyo, Misaki, Enoshima, Onomichi, Kobe, Wakanoura, Hiroshima, Nagasaki, Tsushima.

3. *Pomacentrus* Lacépède.

4. *violascens* Bleeker; Yokohama.
5. *celestis* Jordan and Starks; Wakanoura.
6. *tripunctatus* Cuvier and Valenciennes; Shimoda.

4. *Chrysiptera* Swainson:7. *melas* (Kuhl and Van Hasselt).8. *bonang* (Bleeker); Misaki.5. *Glyphisodon* Lacépède.9. *saratis* (Linnaeus); Misaki, Yogashima, Enoshima, Shinoda, Formosa.10. *curaçao* (Bloch).11. *sordidus* (Forskål); Misaki, Formosa.

Family II. LABRIDÆ.

6. *Chærops* Rüppell.12. *azurio* Jordan and Snyder; Tokyo, Misaki, Wakanoura, Kobe, Hakata, Nagasaki, Formosa.13. *anchorago* (Bloch).7. *Lepidaplois* Gill.14. *axillaris* (Bennett); Nafa.15. *perditio* (Quoy and Gaimard); Wakanoura.8. *Verreo* Jordan and Snyder.16. *oxycephalus* (Bleeker); Tokyo.9. *Semicossyphus* Günther.17. *reticulatus* (Cuvier and Valenciennes); Tokyo, Misaki, Wakanoura, Onomichi, Hakata.10. *Duymeria* Bleeker.18. *flagellifera* (Cuvier and Valenciennes); Tokyo, Misaki, Wakanoura, Kobe, Nagasaki, Formosa.11. *Pseudolabrus* Bleeker.19. *japonicus* (Houttuyn); Tokyo, Misaki, Kobe, Hiroshima, Tsuruga, Hakata, Nagasaki, Tsushima.20. *gracilis* (Steindachner); Misaki, Nagasaki.12. *Anampses* Cuvier.21. *geographicus* Cuvier and Valenciennes.13. *Stethojulis* Günther.22. *psacas* Jordan and Snyder; Nafa.23. *strigiventer* Bennett.24. *terina* Jordan and Snyder; Misaki, Boshu.25. *trossula* Jordan and Snyder; Misaki, Wakanoura.14. *Hemigymnus* Günther.26. *melapterus* (Bloch).27. *fasciatus* (Thunberg).15. *Güntheria* Bleeker.28. *trimaculata* (Quoy and Gaimard).

16. *Halichæres* Rüppell.

29. *pacilopterus* (Schlegel); Aomori, Matsushima, Tokyo, Misaki, Wakanoura, Kobe, Onomichi, Hiroshima, Tsuruga, Nagasaki.
30. *bleekeri* (Steindachner and Döderlein); Tokyo, Misaki, Kobe, Onomichi, Hiroshima, Nagasaki.
31. *tremebundus* Jordan and Snyder; Hiroshima, Nagasaki, Misaki, Wakanoura.

17. *Coris* Lacépède.

32. *aygula* Lacépède; Wakanoura.

18. *Julis* Cuvier.

33. *formosa* (Bennett).

19. *Cheilio* Lacépède.

34. *inermis* (Forskål); Nafa.

20. *Thalassoma* Swainson.

35. *cupido* (Schlegel); Tokyo, Misaki, Nagasaki.
36. *lutescens* (Solander); Nafa.
37. *dorsale* (Quoy and Gaimard).

21. *Gomphosus* Lacépède.

38. *tricolor* (Quoy and Gaimard); Nafa.
39. *varius* Lacépède; Kagoshima.

22. *Cirrhitabrus* Schlegel.

40. *temmincki* (Bleeker); Wakanoura.

23. *Cheilinus* Lacépède.

41. *oxyrhynchus* Bleeker; Riukiu.

24. *Iniistius* Gill.

42. *dea* (Schlegel); Tokyo, Misaki, Wakanoura, Nagasaki.

Family III. SCARIDÆ.

25. *Calotomus* Gilbert.

43. *japonicus* (Cuvier and Valenciennes); Tokyo, Yokohama, Misaki, Wakanoura, Nagasaki.

26. *Scarus* Forskål.

44. *globiceps* Cuvier and Valenciennes.
45. *ovifrons* Schlegel; Nagasaki.

LIST OF GENERIC TERMS PROPOSED FOR BIRDS DURING
THE YEARS 1890 TO 1900, INCLUSIVE, TO WHICH ARE
ADDED NAMES OMITTED BY WATERHOUSE IN HIS
"INDEX GENERUM AVIUM."

By CHARLES W. RICHMOND,
Assistant Curator, Division of Birds.

Mr. F. H. Waterhouse's *Index Generum Avium*, comprising a list of the generic and subgeneric terms proposed in the class Aves from the time of Linnæus down to the summer of 1889, is a work of much value to the systematic ornithologist, and one of unusual accuracy—every reference, with a half dozen exceptions, having been verified by its author.

The continued activity of workers in this branch of zoology during the past decade, both in the introduction of new names and the resurrection of old and forgotten ones, has rendered necessary the publication of a supplementary list. In compiling such a list the present writer has made use of a card catalogue¹ now in course of preparation in the Division of Birds of the United States National Museum, which contains references to most of the genera and species described in recent years, as well as to many of earlier date.

Out of about 675 names enumerated in the following pages 475 have been instituted as new since the appearance of the Index; the remainder consist of terms overlooked by Waterhouse, or used by him either without proper citation or as homonyms of other genera (e. g., *Piculus*). No effort has been made to swell the list of names omitted in the Index, but the fact that nearly two hundred names² here given were used

¹This card catalogue was begun in 1889 and has been carried along more or less actively since 1893. It now contains over twenty thousand entries, and is intended eventually to contain a reference to every described avian genus and species, including both living and fossil forms. In the case of species the type locality, collector, date, sex, and location of the type specimen are given; on generic cards are indicated the class of data followed in the ensuing list.

²Not including terms based on "bird tracks," of which there are numbers, such as *Amblonyx*, *Ancyropus*, *Argozoum*, *Batrachopus*, *Brontozoum*, *Calopus*, *Eubrontes*, *Fulicopus*, *Grallator*, *Harpedactylus*, *Ornithopus*, *Palamopus*, *Platypterna*, *Plectropus*, *Sauropus*, *Sillimanius*, *Steropoides*, *Triænopus*, *Tridentipes*, and *Typopus*, all proposed by Hitchcock.

prior to 1889, and overlooked in that work, shows that much patient research remains to be done before a complete list of the generic names of birds may be attempted.

In order to enhance the usefulness of the present list the type species of each genus has been added, as well as various cross references of interest. The family in which each genus belongs is indicated, and, it is believed, the differentiation of fossil genera (by means of a †) will also prove of value. To facilitate the finding of genera in any particular family a list of genera arranged alphabetically under families has been appended.

For various names and references, which would otherwise have been overlooked, the writer is under obligations to Drs. L. Stejneger, and T. S. Palmer, and Mr. H. C. Oberholser.

Abbotornis RICHMOND, Proc. U. S. Nat. Mus., XIX, May 13, 1897, p. 692.

New name for *Leptopterus* Bonaparte, 1854 (not *Leptoptera* Boisdual, 1842) -----[*Laniidæ*.]

Named for Dr. W. L. Abbott.

Abeltera HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 351.

New name for *Sula* Brisson, on grounds of purism...[*Sulidæ*.]
'Αβέλτερος, silly, stupid.

Abelterus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 227.

New name for *Eubucco* Bonaparte, on grounds of purism.

'Αβέλτερος, silly, stupid. [*Capitonidæ*.]

Acmonorhynchus OATES, Fauna of Brit. India (Birds), II, 1890, p. 381.

Type, *Prionochilus vincens* Scater -----[*Dicæidæ*.]
"Ακμων, anvil; ῥύγχος, bill, beak.

Actia HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 329.

New name for *Arquatella* Baird, on grounds of purism.

"Ακτιος, of the seashore. [*Scolopacidæ*.]

†**Actiornis** LYDEKKER, Catal. Fossil Birds Brit. Mus., 1891, p. 56.

Type, *Actiornis anglicus* Lydekker -----[*Phalacrocoracidæ*.]
"Ακτιος, of the seashore; ὄρνις, bird.

Actophilus OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 202.

New name for *Phyllopezus* Sharpe, 1896 (not *Phyllopezus* Peters, 1877) -----[*Jacaniidæ*.]

'Ακτή, beach; φιλέω, I love.

- Adelonetta** HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 346.
New name for *Puanetta* Bonaparte, on grounds of purism. [Anatidæ.]
- "*Ἀδελος*, unknown, obscure; *νήττα*, a duck.
- Ægialodes** HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 327.
New name for *Gambetta* Kaup, on grounds of purism. [Scolopacidæ.]
- Αἰγιαλώδης*, found on or near the shore.
- † **Ægialornis** LYDEKKER, Catal. Fossil Birds Brit. Mus., 1891, p. 183.
Type, *Ægialornis gallicus* Lydekker. [Ægialornithidæ.]
- Αἰγιαλός*, beach, seashore; *ὄρνις*, bird.
- Aerocharis** GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. ix.
New name for *Euryceros* Lesson. [Prionopidæ.]
- "*Ἄηρ*, air; *χάρις*, grace.
- Æronauts** HARTERT, Catal. Birds Brit. Mus., XVI, 1892, p. 459.
Type, *Cypselus melanoleucus* Baird. [Micropodidæ.]
- "*Ἄηρ*, air; *ναύτης*, a sailor.
- Æthiopsar** SHARPE MS., OATES, Fauna of Brit. India (Birds), I, Dec., 1889, p. 539.
Type, *Pastor fuscus* Wagler. [Sturnidæ.]
(A subgenus of *Acridotheres*.)
- Αἰθίοψ*, an Ethiop, a negro; *ψάρ*, starling.
- Agriocharis** CHAPMAN, Bull. Amer. Mus. Nat. Hist., VIII, Dec. 11, 1896, p. 288.
Type, *Meleagris ocellata* Cuvier. [Phasianidæ.]
- "*Ἀγριος*, wild; *χάρις*, grace.
- Agropsar** OATES, Fauna of Brit. India (Birds), I, Dec., 1889, p. 530.
Type, *Gracula sturnia* Pallas. [Sturnidæ.]
- "*Ἀγρός*, field; *ψάρ*, starling.
- Alcatras** HERMANN, Tabula Affin. Anim., 1783, p. 156, note; p. 235.
Type, *Alcatraz* (Journ. de Physique, 1779, p. 475). [Incertæ sedis.]
- Alcatraz*, a pelican or sea bird (Spanish).
- Alcidius** BOUCARD, Genera of Humming Birds (in Humming Bird, V, Pt. 3), Sept. 1895, p. 345.
Type, *Orthorhynchus estella* d'Orbigny. [Trochilidæ.]
- Named for Alcide Dessalines d'Orbigny.
- Aleator** GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. x.
New name for *Pogonias* Illiger. [Capitonidæ.]
- Alector** GLOGER, Hand- und Hilfsbuch, I, 1842, p. 384.
New name for *Gallus* Brisson. [Phasianidæ.]

Alectromorphnus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 271.

New name for *Buteogallus* Lesson, on grounds of purism.

[*Falconidæ*.]

'*Ἀλεκτρυών*, a cock; *μόρφνος*, dark, like an eagle, hence an eagle.

Allenia CORY, Auk, VIII, Jan., 1891, p. 42.

Type, *Turdus montanus* Lafresnaye [*Mimidæ*.]

Named for Dr. J. A. Allen.

Allocotops SHARPE, Ibis, ser. 5, VI, Oct., 1888, p. 389.

Type, *Allocotops calvus* Sharpe [*Timaliidæ*.]

'*Ἀλλόκοτος*, unusual; *ὤψ*, face.

Alopecœnas FINSCH MS., SHARPE, Hand-list of Birds, I, 1899, p. 90.

Type, *Phlogœnas hoedti* Schlegel [*Peristeridæ*.]

'*Ἀλώπηξ*, a fox; *οινάς*, wild pigeon.

Alophoixus OATES, Fauna of Brit. India (Birds) I, Dec., 1889, p. 259.

Type, *Ixos phœocephalus* Hartlaub [*Timaliidæ*.]

"*Ἀλοφος*, without a crest; + *Ixus* (*ἰξός*, sticky, also a miserly fellow).

Alopochen STEJNEGER, Standard Nat. History, IV (Birds), 1885, p. 141.

New name for *Chenalopex* Stephens, preoccupied. . . [*Anatidæ*.]

'*Ἀλωπός*, fox-colored; *χήν*, a goose.

Alticeps GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. viii.

New name for *Cephalopterus* Geoffroy St.-Hilaire. . . [*Cotingidæ*.]

Altus, high; *ceps* (*caput*), head.

Amalocichla DE VIS, Ann. Report Brit. New Guinea (1890-91), 1892, App. CC, p. 95.

Type, *Amalocichla sclateriana* De Vis [*Timaliidæ*.]

'*Ἀμαλός*, soft, feeble; *κίχλη*, a thrush-like bird.

Amaurocichla SHARPE, Proc. Zool. Soc. Lond., Aug., 1892, p. 228.

Type, *Amaurocichla bocagii* Sharpe [*Timaliidæ*.]

'*Ἀμαυρός*, dark; *κίχλη*, a thrush, or thrush-like bird.

Amaurœnas SALVADORI, Catal. Birds Brit. Mus., XXI, 1893, p. 248.

Type, *Columba polleni* Schlegel [*Columbidæ*.]

(A subgenus of *Columba*).

'*Ἀμαυρός*, dark; *οινάς*, a wild pigeon.

Amaurolimnas SHARPE, Bull. Brit. Orn. Club, I, Jan 26, 1893, p. xxviii.

Type, *Rallus concolor* Gosse [*Rallidæ*.]

'*Ἀμαυρός*, dark; *λιμνάς* (*λιμναῖος*), marshy, of the water.

Amazilia LESSON, L'Écho du Monde Savant, ser. 2, VII, No. 32, Oct. 22, 1843, col. 757.

Type¹ [*Trochilidæ*.]

Amazilia, a heroine of the Incas.

¹Proposed as a "race" or subgenus of *Ornismya*, with the following species: *O. lumachella* Lesson, *O. eximia* Delattre, *O. cinnamomea* Lesson, *O. clarisse* Longuemare.

† **Ameghinia** SHARPE, Hand-list of Birds, I, 1899, p. 184.

New name for *Pseudolarus* Ameghino, on grounds of purism!

[*Stereornithes*.]

Named for Dr. Florentino Ameghino.

Amnicola GERBE, in Degland and Gerbe, Ornith. Européenne, I, 1867, p. 526.

Type, *Sylvia melanopogon* Temminck [*Turdidæ*.]

Amnis, a stream, river; *icola*, an inhabitant.

† **Amphipelargus** LYDEKKER, Catal. Fossil Birds Brit. Mus., 1891, p. 68.

Type, *Amphipelargus majori* Lydekker [*Ciconiidæ*.]

Ἀμφί, on both sides; *πελαργός*, a stork.

Amytornis STEJNEGER, Standard Nat. History, IV (Birds), 1885, p. 499.

New name for *Amytis* Lesson, preoccupied [*Timaliidæ*.]

Amytis ("Ἀμυτις), a daughter of Astyages; *ὄρνις*.

Anacrites GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, X.

New name for *Paradoxornis* Gould [*Paridæ*?]

Ἀνα, + *κριτής*, a judge, umpire.

Androphilus SHARPE, Ibis, ser. 5, VI, Oct. 1888, p. 390.

Type, *Androphilus accentor* Sharpe [*Timaliidæ*.]

Ἀνὴρ (ἄνδρ-), a man; *φιλέω*, I love.

† **Anisolornis** AMEGHINO, Revista Argentina Hist. Nat., I, Dec., 1891, p. 449.

Type, *Anisolornis excavatus* Ameghino [*Stereornithes*.]

Ἀνισος, unequal; *ὅλος*, whole, entire; *ὄρνις*, bird.

Anomalophrys SHARPE, Catal. Birds Brit. Mus., XXIV, 1896, p. 156.

Type, *Lobiranellus superciliosus* Reichenow [*Charadriidæ*.]

Ἀνώμαλος, unusual; *ὄφρύς*, brow, eyebrow.

† **Anomalornis** HUTTON, Trans. New Zealand Inst., XXIX, June, 1897, p. 546.

New name for *Anomalopteryx* Reichenbach, preoccupied.

[*Dinornithidæ*.]

Ἀνώμαλος, unusual; *ὄρνις*, bird.

Anopaia HALDEMAN, Proc. Acad. Nat. Sci. Phila., I, 1842, p. 188.

New name for "*Harpyia* Cuvier" (= *Harpia* Vieillot), preoccupied [*Falconidæ*.]

Ἀνοπαῖα, unnoticed.

Antichromus RICHMOND, Auk, XVI, Apr., 1899, p. 187.

New name for *Bocagia* Shelley, preoccupied [*Laniidæ*.]

Ἀντί, against, opposite to; *χρῶμα*, color.

Antrochelidon BALDAMUS, Journ. für Orn., Nov., 1869, p. 406.

Type, *Hirundo nigricans* Vieillot [*Hirundinidæ*.]

Ἄντρον, a cavern; *χελιδών*, swallow.

Anurolimnas SHARPE, Bull. Brit. Orn. Club, I, Jan. 26, 1893, p. xxviii.

Type, *Porzana castaneiceps* Sclater and Salvin [*Rallidæ*.]

Ἄν, without; *οὐρά*, tail; *λιμνάς* (λιμναῖος), marshy, of the mere.

- Aphanolimnas** SHARPE, Bull. Brit. Orn. Club, I, Dec. 31, 1892, p. xx.
New name for *Kittlitzia* Hartlaub, preoccupied [*Rallidae*.]
'Αφανής, unseen, obscure; λιμνάς (λιμναῖος), marshy, from the mere.
- Aphelocephala** OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 214.
New name for *Xerophila* Gould, preoccupied [*Paridae*.]
'Αφελής, smooth; κεφαλή, head.
- Aphrastura** OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 211.
New name for *Oxyurus* Swainson, preoccupied . . [*Furnariidae*.]
'Αφραστός, wonderful; οὐρά, tail.
- Araclanga** GLOGER, Hand- und Hilfsbuch, I, 1842, p. 193.
New name for *Ara* Brisson, on grounds of purism. [*Psittucidae*.]
'Αρά (*Ara*); κλαγγή, screaming.
- Aramidopsis** SHARPE, Bull. Brit. Orn. Club, I, July 4, 1893, p. liv.
Type, *Rallus plateni* Blasius [*Rallidae*.]
Aramides, + ὄψις, appearance.
- † **Archaeotrogon** MILNE-EDWARDS, Compte-Rendu Second Congrès Ornith. Int., II, 1892, p. 64.
Type, *Archaeotrogon venustus* Milne-Edwards [*Trogonidae*.]
'Αρχαῖος, ancient; + *Trogon*.
- † **Ardeacites** HAUSHALTER, Murkwürdige fossile Thierüberreste aus der Algäuer Molasse, 1855, p. 11.
Type, *Ardeacites molassicus* Haushalter [*Ardeidae*.]
Ardea, a heron, + *ites*.
- Areortyx** HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 290.
New name for *Areoturnix* Bonaparte, on grounds of purism. [*Turnicidae*.]
- † **Argillornis** OWEN, Quart. Journ. Geol. Soc., XXXIV, Jan., 1878, p. 124.
Type, *Argillornis longipennis* Owen [*Phalacrocoracidae*.]
'Αργίλλος, white clay, chalk; ὄρνις, bird.
- Arinia** MULSANT, "Ann. Soc. Linn. Lyon, 1877, Oct. 12" [exists as a separate paper only].
Type, *Arinia bowardi* Mulsant [*Trochilidae*.]
- Arquata** GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. 92.
New name for *Numida* Linnæus [*Phasianidae*.]
- Arremonops** RIDGWAY, Manual N. A. Birds, ed. 2, Apr., 1896, p. 605.
Type, *Embernagra rufirigata* Lawrence [*Fringillidae*.]
Arremon (ἀρρόμων, silent); + ὤψ.
- Asarcia** SHARPE, Catal. Birds Brit. Mus., XXIV, 1896, p. 86.
Type, *Parra variabilis* Linnæus [*Jacaniidae*.]
'Ασαρκος, without flesh, lean.

- Asarcornis** SALVADORI, Catal. Birds Brit. Mus., XXVII, 1895, p. 59.
 Type, *Anas scutulata* S. Müller [*Anatidæ*.]
 'Ασαρκος, lean; ὄρνις, bird.
- Ascalaphia** ISID. GEOFFROY ST.-HILAIRE, L'Écho du Monde Savant, III, 1837, p. 4.
 Type, *Ascalaphia savignii* Isid. Geoffroy St.-Hilaire.
 [Bubonidæ.]
- 'Ασκάλαφος, a bird supposed to be an owl.
- Aspatha** SHARPE, Catal. Birds Brit. Mus., XVIII, 1892, p. 331.
 Type, *Prionites gularis* Lafresnaye [*Momotidæ*.]
 'Α, without; πλάθη, a blade.
- † **Asthenopterus** AMEGHINO, Revista Argentina Hist. Nat., I, 1891, p. 443.
 New name for *Lagopterus* Moreno and Mercerat, preoccupied.
 [Falconidæ.]
- 'Ασθενής, weak; πτερόν, wing.
- Atalochrous** ELLIOT, Ibis, ser. 3, VI, Oct., 1876, p. 464.
 Type, *Malimbus rachelia* Cassin [*Ploceidæ*.]
 (A subgenus of *Malimbus*.)
 'Αταλός, tender, delicate; χρώς, color.
- Atopornis** REICHENOW and NEUMANN, Ornith. Monatsb., III, May, 1895, p. 74.
 Type, *Atopornis* [= *Nigrita*] *diabolicus* Reichenow and Neumann [*Muscicapidæ* (= *Ploceidæ*).]
 "Ατοπος, unusual, out of place; ὄρνις, bird.
- † **Badiostes** AMEGHINO, Bol. Inst. Geogr. Argentino, XV, 1895, p. 600.
 Type, *Badiostes patagonicus* Ameghino [*Strigidæ*.]
- † **Barornis** MARSH, Amer. Journ. Sci., ser. 3, XLVIII, Oct., 1894, p. 344.
 Type, *Barornis regens* Marsh [*Incertæ sedis*.]
 Βαρύς, heavy; ὄρνις, bird.
- Bathmisyrma** REICHENOW, Ornith. Monatsb., V, Oct., 1897, p. 161.
 Type, *Bathmisyrma rufum* Reichenow [*Muscicapidæ*.]
 Βαθμός, a step; σύρμα, a trailing robe, something trailed along.
- Bathmocercus** REICHENOW, Ornith. Monatsb., III, July, 1895, p. 113.
 Type, *Bathmocercus rufus* Reichenow [*Timaliidæ*.]
 Βαθμός, a step; κέρκος, tail.
- Bellona** MULSANT and VERREAUX, Mém. Soc. Imp. Sci. Nat. Cherbourg, XII, 1866, p. 219.
 Type, *Trochilus cristatus* Linnæus [*Trochilidæ*.]
 Named for Bellona, a goddess of war.
- † **Belornis** MILNE-EDWARDS, Bull. Brit. Orn. Club, I, July 4, 1893, p. liv.
 New name for *Tachyornis* Milne-Edwards, preoccupied.
 [Incertæ sedis.]
- Βέλος, an arrow, dart; ὄρνις, bird.

Blacops RICHMOND, Auk, XVI, Apr., 1899, p. 186.

New name for *Blax* Reichenow, preoccupied (= *Verreauxia* Hartlaub) ----- [*Picidae*.]

Blax (βλάξ, lazy); ὤψ.

Blax REICHENOW, Ornith. Monatsb., II, Aug., 1894, p. 126.

Type, *Blax gymnophthalmus* Reichenow (see *Blacops*).

[*Capitonidae* (= *Picidae*).]

Βλάξ, lazy, sluggish.

Bleda BONAPARTE, Revue et Mag. de Zool., Feb., 1857, p. 50.

Type, *Dasycephala syndactyla* Swainson ----- [*Timaliidae*.]

Named for Bleda, brother of Attila.

Bocagia SHELLEY, Bull. Brit. Orn. Club, III, May 26, 1894, p. xliii.

Type, *Telephonus minutus* Hartlaub (first species mentioned) (see *Antichromus*) ----- [*Laniidae*.]

Named for Prof. José Vicente Barboza du Bocage.

Bolbopsittacus SALVADORI, Catal. Birds Brit. Mus., XX, 1891, p. 503.

Type, *Psittacus lunulatus* Scopoli ----- [*Psittacidae*.]

Βολβός, a bulb; *ψίττακος*, a parrot.

Bonapartia BÜTTIKOFER, Notes Leyden Mus., XVIII, July 15, 1896, p. 58.

New name for *Gymnocrotaphus* Büttikofer, preoccupied.

[*Timaliidae*.]

Named for Charles-Lucien-Jules-Laurent Bonaparte.

Bostrycholophus BÜTTIKOFER, Notes Leyden Mus., XVIII, July 15, 1896, p. 58.

New name for *Centrolophus* Büttikofer, preoccupied.

[*Pycnonotidae*.]

Βόστρυχος, a curl; *λόφος*, crest.

Bowdleria ROTHSCILD, Novitates Zoologicae, III, Dec. 29, 1896, p. 539.

Type, New Zealand group of *Sphenæacus* ----- [*Timaliidae*.]

Named for Dr. R. Bowdler Sharpe.

Brachycope REICHENOW, Journ. für Ornithologie, April, 1900, p. 249.

Type, *Brachycope anomala* Reichenow ----- [*Ploceidae*.]

Brachypteryx OWEN, Deser. Catal. Osteol. Series Mus. Roy. College of Surgeons, I, 1853, p. 238.

Type, *Rallus australis* Sparrman ----- [*Rallidae*.]

Brachypus SWAINSON, Zool. Journ., I, Oct., 1824, p. 305.

Type, "Le Curouge" Levaillant (= *Turdus cafer* Linnæus).

[*Pycnonotidae*.]

Βραχύς, short; *πούς*, foot.

Brachyrynchus de SELYS-LONGCHAMPS, in Vander Maelen's Dict. Géogr. Prov. Liège, 1831, Appendice, p. 36.

Type, *Parus caudatus* (= *Mecistura rosea* Blyth) ----- [*Paridae*.]

Βραχύς, short; *ῥύγχος*, beak.

Brachyspiza RIDGWAY, Auk, XV, July (May 13), 1898, p. 224.

Type, *Fringilla capensis* P. L. S. Müller [*Fringillidæ*.]

Βραχύς, short; *σπίζα*, a finch.

Brewsteria MAYNARD, Birds Eastern North Amer., ed. 2, Pt. 40, 1896, p. 691.

Type, *Falco ferrugineus* Lichtenstein [*Falconidæ*.]

Named for Mr. William Brewster.

† **Brontornis** MORENO and MERCERAT, Anales Mus. La Plata (Paleon. Argen., I), 1891, p. 37.

Type, *Brontornis burmeisteri* Moreno and Mercerat.

[*Stereornithes*.]

Βροντή, thunder; *ὄρνις*, bird.

Buleites GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. xi.

New name for *Stenorhynchus* Gould [*Mimidæ*.]

Βουλευτής, one who sits in council, a senator.

Calamodromus REICHENOW, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 322.

New name for *Rougetius* Bonaparte, on grounds of purism.

[*Rallidæ*.]

Κάλαμος, a reed; *δρόμος*, a course, race.

Calastrapia SHARPE, Monogr. Paradiseidæ, Part VIII, 1898, p. xiii.

Type, *Astrapia splendidissima* Rothschild [*Paradiseidæ*.]

Καλός, beautiful; + *Astrapia* (ἀστράπιος, of lightning).

Callaeops GRANT, Bull. Brit. Orn. Club, IV, Jan. 29, 1895, p. xviii.

Type, *Callaeops periophthalmica* Grant [*Muscicapidæ*.]

Κάλλαιον, a cock's comb; ὤψ, eye.

† **Callornis** AMEGHINO, Bol. Inst. Geogr. Argentino, XV, 1895, p. 574.

Type, *Callornis giganteus* Ameghino [*Stereornithes*.]

Κάλλος, beauty; *ὄρνις*, bird.

Calobamon HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 123.

New name for *Pittasoma* Cassin, on grounds of purism.

[*Formicariidæ*.]

Καλός, beautiful; βᾶμα (βῆμα), a step, pace.

Calopelia SALVADORI, Catal. Birds Brit. Mus., XXI, 1893, p. 522.

Type, *Columba puella* Schlegel [*Peristeridæ*.]

Καλός, beautiful; πέλεια, a dove.

Calopezus RIDGWAY, Proc. Biol. Soc. Wash., II, Apr. 10, 1884, p. 97.

New name for *Calodromas* Selater and Salvin, preoccupied.

[*Tinamidæ*.]

Καλός, beautiful; πεζός, walking.

Calvifrons DAUDIN, Annales du Mus. d'Hist. Nat., III, 1804, p. 146.

Type, *Chauvard* (= *Corvus calvus* Linnæus) (see *Perissocephalus*) [*Cotingidæ*.]

Calvus, bald, hairless; *frons*, forehead.

†**Camaskelus** AYMARD, Congrès Scientifique de France, 1856, I, pp. 233, 267.

Type, *Camaskelus palustris* Aymard [Charadriiformes.]

Κάμαξ, a pole, stake; σκέλος, the leg.

Capornis KAUP, in Jardine's Contrib. Orn. for 1849, p. 112 (note).

Type, *Vultur pileatus* Burchell [Vulturidæ.]

Carnifex SUNDEVALL, K. Vet.-Akad. Handl. (1835), 1836, p. 78.

Type, *Ampelis carnifex* Linnæus [Cotingidæ.]

Carnifex, a public executioner.

Cassidix BONAPARTE, Conspectus Generum Avium, I, 1849, p. 90.

Type, *Buceros cassidix* Temminck (first species mentioned).

[Bucerotidæ.]

Cassida, *cassis*, a helmet.

Castanolimnas SHARPE, Bull. Brit. Orn. Club., I, Jan. 26, 1893, p. xxviii.

Type, *Euryzona canningi* Blyth [Rallidæ.]

Κάστανος, the chestnut; λιμνός (λιμναῖος), marshy, from the mere.

Cataphania GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. x.

New name for "*Oxyptera* Cuvier" [Artamidæ.]

Καταφάνεια, clearness, transparency.

Cataponera HARTERT, Novitates Zoologicae, III, Mar. 14, 1896, p. 70.

Type, *Cataponera turdoides* Hartert [Timaliidæ.]

Καταπονέω, I tire out.

Centrolophus BÜTTIKOFER, Notes Leyden Mus., XVII, June 9, 1896, p. 230.

Type, *Brachypus leucogenys* Gray (see *Rostrycholophus*).

[Pycnonotidæ.]

Κέντρον, spur; λόφος, a crest.

†**Centronis** ANDREWS, Ibis, ser. 7, III, July, 1897, p. 344.

Type, *Centronis majori* Andrews [Anatidæ.]

Κέντρον, spur, spine; ὄρνις, bird.

Cerasophila BINGHAM, Ann. Mag. Nat. Hist., ser. 7, V, no. 28, Apr., 1900, p. 358.

Type, *Cerasophila thompsoni* Bingham [Pycnonotidæ.]

Κέρασος, a cherry tree; φιλέω, I love.

Certhiaxis LESSON, Compl. Œuvres de Buffon (éd. Lévêque), XX, Apr., 1847, p. 287.¹

Type, *Certhia cinnamomea* Gmelin [Furnariidæ.]

Certhia (κέρθιος, a creeper); + [*Synall*] *axis*.

¹This work is usually cited "Descr. mam. et ois.," or "Descr. mam. et ois. réc. découv.," but is correctly quoted as above. It appeared as the last (20th) volume of the Lévêque edition of Buffon, and was published in April, 1847. It was also issued as a separate work, under the title "Description de mammifères et d'oiseaux récemment découverts," etc., with the same ostensible date, and later formed the second part of Tome VII of the Didier edition, in 10 volumes, also bearing date of 1847. All were printed from the same type, the Didier edition even preserving the Lévêque signature marks.

- Cetupa** LYDEKKER, Catal. Fossil Birds Brit. Mus., 1891, p. 15.
Emendation of *Ketupa* Lesson.....[*Bubonidæ*.]
Ketupa, native name of a Javan owl.
- Chalcopsar** SHARPE, Catal. Birds Brit. Mus., XIII, 1890, p. 158.
New name for *Megalopterus* Smith, preoccupied ...[*Sturnidæ*.]
Χαλκός, copper; *ψάρ*, starling.
- Chelidonaria** REICHENOW, Journ. für Orn., Apr., 1889, p. 187.
Type, *Hirundo urbica* Linnæus.....[*Hirundinidæ*.]
Chelidon (χελιδών, a swallow).
- Chema** REICHENOW, Journ. für. Orn., Apr., 1889, p. 188.
Emendation of *Xema* Leach[*Laridæ*.]
Χήμη, yawning, gaping.
- †**Chenornis** PORTIS, Mem. R. Acc. Sci. Torino, ser. 2, XXXVI, 1885, p. 364.
Type, *Chenornis graculoides* Portis.....[*Anatidæ*.]
Χήν, goose; *ὄρνις*, bird.
- Chersophilus** SHARPE, Catal. Birds Brit. Mus., XIII, 1890, p. 525.
Type, *Alauda duponti* Vieillot.....[*Alaudidæ*.]
Χέρσος, dry land; *φιλέω*, I love.
- Chlorocharis** SHARPE, Ibis, ser. 5, VI, Oct., 1888, p. 392.
Type, *Chlorocharis emiliæ* Sharpe[*Timaliidæ*.]
Χλωρός, green; *χάρις*, grace.
- Chlorodrepanis** PERKINS, in Wilson and Evans, Aves Hawaienses, Pt. 7, June, 1899, p. xxi.
Type, *Himatione stejnegeri* Wilson (first species mentioned).
[*Drepanidæ*.]
Χλωρός, green; + *Drepanis* (δρεπάνη, a sickle).
- †**Chosornis** DE VIS, Proc. Roy. Soc. Queensl., VI, 1889, p. 55.
Type, *Chosornis præteritus* De Vis.....[*Megapodidæ*.]
Χῶσις, heaping up of earth; *ὄρνις*, bird.
- Chrysomitridops** WILSON, Proc. Zool. Soc. Lond., Apr., 1890, p. 445.
Type, *Chrysomitridops cæruleirostris* Wilson.....[*Drepanidæ*.]
Chrysomitris (χρυσομήτρις, the goldfinch); + *ὤψ*.
- †**Cimolopteryx** MARSH, Amer. Journ. Science, ser. 3, XXXVIII, July, 1889, p. 83.
Type, *Cimolopteryx rarus* Marsh[*Incertæ sedis*.]
Κιμωλία, white earth, chalk; *πτέρυξ*, wing.
- Ciridops** "WILSON," A. NEWTON, Nature, XLV, Mar. 17, 1892, p. 469.
Type, *Fringilla anna* Dole.....[*Drepanidæ*.]
[*Emberiza*] *ciris*; + *ὤψ*.
- Cirulus** BREDOW, Archiv für Naturgesch., III, Pt. 1, 1837, p. 413.
Type, *Cirulus pratensis* Bredow (= *Sturnella magna meridionalis*).....[*Icteridæ*.]
- †**Cladornis** AMEGHINO, Bol. Inst. Geogr. Argentino, XV, 1895, p. 584.
Type, *Cladornis pachypus* Ameghino.....[*Cladornithidæ*.]
Κλάδος, branch, or shoot of a tree; *ὄρνις*, bird.

Cladurus REICHENOW, Journ. für Orn., Jan., 1877, p. 17.

New name for *Xylobucco* Bonaparte [*Capitonidæ*.]
Κλάδος, branch; *ὄψος*, guard.

Clamator KAUP, Naturl. Syst., 1829, p. 53.

Type, *Cuculus glandarius* Linnæus [*Cuculidæ*.]

Claravis OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 203.

New name for *Peristera* Swainson, preoccupied .. [*Peristeridæ*.]

Clarus, clear; *avis*, bird.

Claudia HARTERT, Catal. Birds Brit. Mus., XVI, 1892, p. 469.

Type, *Cypselus squamatus* Cassin [*Micropodidæ*.]

Named for Mrs. Ernst Hartert.

Cleptornis OUSTALET, Le Naturaliste, ser. 2, III, Nov. 1, 1889, p. 260.

Type, *Ptilotis marcheii* Oustalet [*Meliphagidæ*.]

Κλέπτω, I steal; *ὄρνις*, bird.

Clibanus GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848,
 p. xi.

New name for *Tanagroides* Bonaparte [*Fringillidæ*.]

Κλίβανος (κλιβανίτης, baked under a pot or pan), with reference
 to its tropical habitat?

Clytospiza SHELLEY, Birds of Africa, I, 1896, p. 32.

Type, *Pytelia monteiri* Hartlaub [*Ploceidæ*.]

Κλυτός, famous; *σπιζα*, a finch.

Cnemophilus DE VIS, Ann. Report Brit. New Guinea (1888-89), 1890,
 App. G, p. 61.

Type, *Cnemophilus macgregorii* De Vis [*Ptilonorhynchidæ*.]

Κνημός, slope of a mountain; *φιλέω*, I love.

Coccyzenas HEINE, in Heine and Reichenow, Nomencl. Mus. Hein.
 Orn., 1890, p. 278.

New name for *Reinwardtana* Bonaparte, on grounds of purism.
 [*Columbidæ*.]

Κόκκυξ, cuckoo; *οινάς*, a wild pigeon.

Cocornis TOWNSEND, Bull. Mus. Comp. Zool., XXVII, July, 1895,
 p. 123.

Type, *Cocornis agassizi* Townsend [*Fringillidæ*.]

Cocos, name of an island; *ὄρνις*, bird.

Coelotreron HEINE, in Heine and Reichenow, Nomencl. Mus. Hein.
 Orn., 1890, p. 275.

New name for *Palumbana* Bonaparte, on grounds of purism.

..... [*Columbidæ*.]

Κοῖλος, hollow; *τρήρων*, a dove.

Colinus GOLDFUSS, Handbuch der Zoologie, II, 1820, p. 220.

Type, *Tetrao mexicana* Linnæus [*Phasianidæ*.]

Colymbetes HEINE, in Heine and Reichenow, Nomencl. Mus. Hein.
 Orn., 1890, p. 364.

New name for *Poliocephalus* Selby [*Colymbidæ*.]

Κολυμβητής, a diver, swimmer.

- Compsortyx** HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 292.
New name for *Excalfactoria* Bonaparte, on grounds of purism. [Phasianidæ.]
Κομφός, elegant; *ὄρνυξ*, a quail.
- Compsospiza** BERLEPSCH, Ibis, ser. 6, V, Apr., 1893, p. 207.
Type, *Compsospiza garleppi* Berlepsch.....[Fringillidæ.]
Κομφός, elegant; *σπίζα*, finch.
- Compsotis** HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 325.
New name for *Afrotis* Bonaparte, on grounds of purism. [Otididæ.]
Κομφός, elegant; *ὠρίς*, a bustard.
- † **Coniornis** MARSH, Amer. Journ. Sci., ser. 3, XLV, Jan., 1893, p. 81.
Type, *Coniornis altus* Marsh.....[Hesperornithidæ.]
Κόνις, dust; *ὄρνις*, bird.
- Conuropsis** SALVADORI, Catal. Birds Brit. Mus., XX, 1891, p. 203.
Type, *Psittacus carolinensis* Linnæus.....[Psittacidæ.]
Conurus (*κῶνος*, a cone; *οὐρά*, tail); + *ὄψις*, aspect.
- Coracoeichla** SHARPE, Catal. Birds Brit. Mus., XVII, 1892, p. 7 (note).
New name for *Coracopitta* Selater (not *Corapitta* Bonaparte) (see *Mellopitta*).....[Pittidæ.]
Κόραξ (*κόρακ*-), raven; *κίχλη*, thrush.
- Cornix** FORSTER, Synoptical Catalogue of British Birds, 1817, p. 5.
Type, *Corvus graculus*, *C. monedula* Linnæus.....[Corvidæ.]
- Corydon** GLOGER, Hand- und Hilfsbuch, I, 1842, p. 264.
New name for *Melanocorypha* Boie.....[Alaudidæ.]
Κορυδών, a lark.
- Coryphænas** R. G. W. RAMSAY, Ibis, ser. 6, Apr., 1890, p. 246.
Type, *Turacænas crassirostris* Gould.....[Columbidæ.]
Κορυφή, head, top; *οινάς*, a wild pigeon.
- Cosmophoneus** NEUMANN, Journ. für Orn., July, 1899, p. 392.
Type, *Laniarius multicolor* Gray (first species mentioned). [Laniidæ.]
Κόσμος, ornament; *φονεύς*, a murderer, slayer.
- † **Creccoides**¹ SHUFELDT, Proc. Amer. Phil. Soc., XXX, No. 137, Apr. 14, 1892, p. 125.
Type, *Creccoides osbornii* Shufeldt.....[Rallidæ.]
Κρέξ, a crane; *εἶδος*, form.
- Crecopsis** SHARPE, Bull. Brit. Orn. Club, I, Jan. 26, 1893, p. xxviii.
Type, *Crex egregia* Peters.....[Rallidæ.]
Κρέξ, a crane; *ὄψις*, aspect.

¹ Emended to *Creccoides* Shufeldt, Journ. Acad. Nat. Sci. Phila., IX, pt. 3, 1892, p. 412 (note).

- Crocomorphus** HARGITT, Catal. Birds Brit. Mus., XVIII, 1890, p. 439.
Type, *Picus flavus* P. L. S. Müller [*Picidae*.]
Κρόκος, saffron; *μορφή*, form, shape, figure.
- Cryptillas** OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 212.
New name for *Phlæx* Hartlaub, preoccupied [*Timaliidae*.]
Κρυπτός, hidden; *Ἰλλάς*, a thrush.
- Cryptophaps** SALVADORI, Catal. Birds Brit. Mus., XXI, 1893, p. 219.
Type, *Carpophaga pæcilorrhœa* Brüggemann [*Treronidae*.]
(Subgenus of *Carpophaga*.)
Κρυπτός, hidden; *φάψ*, a pigeon.
- †**Cryptornis** MILNE-EDWARDS, Recher. Ois. Foss. France, II, 1870, p. 371.
Type, *Centropus? antiquus* Gervais [*Incertæ sedis*.]
Κρυπτός, hidden; *ὄρνις*, bird.
- Cumana** COUES, Auk, XVII, Jan., 1900, p. 65.
New name for *Pipile* Bonaparte (vs. *Pipilo* Vieillot) .. [*Cracidae*.]
From Cumaná, a town in Venezuela.
- Curotreron** HEINE and REICHENOW, Nomencl. Mus. Hein. Orn., 1890, p. 280.
Emendation of *Kurutreron* Bonaparte [*Treronidae*.]
Κυρώω, I make valid, sure; + *Treron* (*τρήρων*, a dove).
- Cyanerpes** OBERHOLSER, Auk, XVI, Jan., 1899, p. 32.
Type, *Certhia cyanea* Linnæus [*Cærebidae*.]
Κύανος, dark blue; *έρπης* (*έρπω*, I creep, crawl).
- Cyanolesbia** STEJNEGER, Auk, II, Jan., 1885, p. 47.
Type, *Trochilus forficatus* Linnæus [*Trochilidae*.]
Κύανος, dark blue; + *Lesbia*.
- Cyanopitta** GOULD, Monograph Pittidae, Pt. 1, 1880, pl. viii.
Type, *Brachyurus steerii* Sharpe [*Pittidae*.]
Κύανος, dark blue; + *Pitta*.
- Cymatobolus** REICHENOW, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 363.
New name for *Majaqucus* Reichenbach, on grounds of purism. [*Puffinidae*.]
Κυματόω, I rise in waves; *βόλος*, a throw.
- Cymindus** HALDEMAN, Proc. Acad. Nat. Sci. Phila. I, 1842, p. 191.
Substitute for *Cymindis* Cuvier, preoccupied [*Falconidae*.]
Κύμινδης, a hawk-like bird mentioned by Aristotle.
- Cyphorhina** LESSON, L'Écho du Monde Savant, ser. 2, VII, June 15, 1843, col. 1068.
Type, *Podargus papuensis* Quoy and Gaimard [*Podargidae*.]
Κυφός, bent; *ρίς*, *ρίν*, nose.
- Dactylortyx** GRANT, Catal. Birds Brit. Mus., XXII, 1893, p. 429.
Type, *Ortyx thoracicus* Gambel [*Iphasianidae*.]
Δάκτυλος, finger; *ὄρυξ*, a quail.

Dafilula COUES, Auk, XIV, Apr., 1897, p. 207.

Type, *Querquedula eatoni* Sharpe.....[*Anatidæ*.]

Dafilula, dim. of *Dafila*.

Dammeria HARTERT, Bull. Brit. Orn. Club, VIII, July 4, 1899, p. lvii.

Type, *Dammeria henrici* Hartert.....[*Muscicapidæ*.]

From Dammer, an island in the Banda Sea.

Daphænositta DE VIS, Ibis, ser. 7, III, July, 1897, p. 380.

Type, *Daphænositta miranda* De Vis.....[*Sittidæ*.]

Δαφοινός, bloody, blood-red; + *Sittu* (*σίττη*, a kind of woodpecker).

† **Darwinornis** MORENO and MERCERAT, Anales Mus. La Plata (Paleon. Argen., I), 1891, p. 60.

Type, *Darwinornis copei* Moreno and Mercerat (first species mentioned)[*Stereornithes*.]

Named for Charles Robert Darwin.

Deconychura CHERRIE, Proc. U. S. Nat. Mus., XIV, Sept. 4, 1891, p. 338.

Type, *Deconychura typica* Cherrie.....[*Dendrocolaptidæ*.]

δέκα, ten; *ὄνυξ*, claw; *οὐρά*, tail.

Deltarhynchus RIDGWAY, Proc. U. S. Nat. Mus., XVI, Oct. 25, 1893, p. 606.

Type, *Myiarchus flammulatus* Lawrence.....[*Tyrannidæ*.]

(A subgenus of *Myiarchus*.)

δέλτα, delta; *ρύγχος*, bill, from its Δ -shaped bill.

Dendrophaps BLYTH, Journ. Asiat. Soc. Bengal, XIV, Pt. 2, 1846, p. 855.

Type¹[*Columbidæ*?]

δένδρον, a tree; *ψάψ*, pigeon.

Dendrophassa GLOGER, Hand- und Hilfsbuch, I, 1842, p. 359.

Type, *Columba aromatica* Gmelin[*Treronidæ*.]

δένδρον, a tree; *φάσσα*, a wood pigeon.

Dendrophila HODGSON, Madras Journ. Lit. and Science, V, Apr., 1837, p. 432.

New name for *Arborophila* Hodgson, on grounds of purism.

[*Phasiavidæ*.]

δένδρον, a tree; *φιλέω*, I love.

Dendrotreron "HODGSON," BLYTH, Journ. Asiat. Soc. Bengal, XIV, Pt. 2, 1846, p. 867 (note).

Type, *Columba nipalensis* Hodgson (= *C. hodgsoni* Vigors).

[*Columbidæ*.]

δένδρον, a tree; + *Treron* (*τρήρων*, a dove).

¹"At least three subgenera occur [of *Carpophaga*, as known at that time], at the head of which may be placed *Lopholaimus*, G. R. Gray, founded on the *Col. antarctica*, Shaw (v. *dilopha*, Temminck), of Australia; then follow the ordinary *Dunkuils*, of which the two Indian species are characteristic; and finally a short-winged type, with bill and feet as in the former, and colouring as in the division *Chalcophaps* (of the next subfamily), to which I apply the name *Dendrophaps*."

Dialiptila SALVADORI, Catal. Birds Brit. Mus., XXI, 1893, p. 243.

Type, *Columba guinea* Linnæus (first species mentioned)

(A subgenus of *Columba*)-----[*Columbidae*.]

Διαλύω, I part asunder; *πτίλον*, a feather.

Dialis GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. ix.

New name for *Drepanis* Temminck-----[*Drepanidae*.]

Dialis, ethereal, aerial.

† *Diaphorapteryx* FORBES, Bull. Brit. Orn. Club, I, Dec. 31, 1892, p. xxi.

Type, *Aphanapteryx hawkinsi* Forbes-----[*Rallidae*.]

Διάφορος, different, *Apteryx* (α, priv. + *πτέρυξ*, wing).

Diaphorillas OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 212.

New name for *Amytis* Lesson, preoccupied. (See *Amytornis*.)

[*Timaliidae*.]

Διάφορος, different; *ἰλλάς*, a thrush.

Diaphorpterus OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 214.

New name for *Symmorphus* Gould, preoccupied.

[*Campephagidae*.]

Διάφορος, different; *πτερόν*, wing.

† *Diatropornis* OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 203.

New name for *Tapinopus* Milne-Edwards, preoccupied.

[*Incertæ sedis*.]

Διάτροπος, different; *ὄρνις*, bird.

Diatropura OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 215.

New name for *Chera* Gray, preoccupied-----[*Ploceidae*.]

Διάτροπος, different; *οὐρά*, tail.

Dichrognathus REICHENOW, Journ. für Orn., 1881, p. 255.

New name for *Psittinus* Blyth-----[*Psittacidae*.]

Διχροος, two-colored; *γνάθος*, jaw.

Dictæa GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. ix.

New name for *Emberizoides* Bonaparte-----[*Fringillidae*.]

Dictæus, of Dicte, Dictæan.

Dilobus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 335.

New name for *Lobipluvia* Bonaparte, on grounds of purism.

[*Charadriidae*.]

Δίς, double; *λοβός*, a lobe.

Dinorhamphus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 228.

New name for *Tucanus* Cassin, on grounds of purism.

[*Ramphastidae*.]

Δεινός, mighty; *ράμφος*, beak.

Diplocercus "BLYTH," JERDON, Birds of India, III, 1864, p. 737.

Type, *Tantalus leucocephalus* Forster [*Ciconiidae*.]
Διπλόος, double; *κέρκος*, tail.

Diplura "BLYTH," JERDON, Birds of India, III, 1864, p. 737.¹

Type, *Tantalus leucocephalus* Forster [*Ciconiidae*.]
Διπλόος, double; *οὐρά*, tail.

Dipsaleon GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. x.

New name for *Planetis* Wagler [*Laridae*.]

Dissemurulus OATES, Fauna of Brit. India (Birds), I, Dec., 1889, p. 322.

Type, *Dicrurus lophorinus* Vieillot [*Dicruridae*.]
Dissemurulus, dim. of *Dissemurus*.

Dolychoeix KAUP, Thierreich, II, Pt. 1, 1836, p. 139.

No type mentioned; a *nomen nudum* here [*Incertæ sedis*.]

Donacias HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 321.

New name for *Lewinia* Bonaparte, on grounds of purism.
 [*Rallidae*.]

Δόναξ, a reed, with suffix *> ias*.

Donacophilus REICHENOW, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 320.

New name for *Laterallus* Bonaparte, on grounds of purism.
 [*Rallidae*.]

Δόναξ, a reed; *φιλέω*, I love.

Doriponus REICHENOW, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 308.

New name for *Agamia* Reichenbach, on grounds of purism.
 [*Ardeidae*.]

Δορίπωνος, toiling with the spear.

Drepananax SHARPE, Bull. Brit. Orn. Club, IV, Dec. 29, 1894, p. xv.

Type, *Drepanornis bruïjni* Oustalet [*Paradisidae*.]
Δρεπάνη, a sickle; *ἄναξ*, a lord, king.

Drepanoplectes SHARPE, Ibis, ser. 6, III, Apr., 1891, p. 246.

Type, *Drepanoplectes jacksoni* Sharpe [*Ploceidae*.]
Δρεπάνη, a sickle; *Plectes* (n. l. < *πλεκτός*, woven), a weaver.

Drepanorhamphus ROTHSCILD, Avifauna of Laysan, etc., Pt. 3, Dec., 1900, p. 163.

Type, *Drepanis funerea* Newton [*Drepanidae*.]
Δρεπάνη, a sickle; *ράμφος*, a curved beak.

Drepanorhynchus DUBOIS, Mem. Zool. Soc. France, VII, 1894, p. 400.

Type, *Drepanorhynchus schistaceus* Dubois (see *Spermophilopsis*) [*Fringillidae*.]
Δρεπάνη, a sickle; *δύγχος*, a beak.

¹ This name has precedence (anteriority) over *Diplocercus*.

Drepanorhynchus ROTHSCHILD, Avifauna of Laysan, etc., Pt. 3, Dec., 1900, pl. LXII.

Type, *Drepanis funerea* Newton (see *Drepanorhamphus*).

[*Drepanidæ*.]

Δρεπάνη, a sickle; *ῥύγχος*, a beak.

Dryocolaptes GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. 86.

Type, *Picus tridactylus* Linnæus.....[*Picidæ*.]

Dryolimnas SHARPE, Bull. Brit. Orn. Club, I, Jan. 26, 1893, p. xxviii.

Type, *Rallus cuvieri* Pucheran.....[*Rallidæ*.]

Δρύος, a copse, thicket; *λιμνάς*, marshy, of the mere.

† **Dryornis** MORENO and MERCERAT, Anales Mus. La Plata (Paleon. Argen., I), 1891, p. 59.

Type, *Dryornis pampeanus* Moreno and Mercerat.

[*Stereornithes*.]

Δρῦς, a tree, an oak; *ὄρνις*, a bird.

Dupetor HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 308.

New name for *Ardeiralla* Bonaparte.....[*Ardeidæ*.]

Δουπήτωρ, a clatterer.

Dybowskia OUSTALET, Le Naturaliste, ser. 2, VI, Sept. 15, 1892, p. 218.

Type, *Dybowskia kemoensis* Oustalet.....[*Timaliidæ*.]

Named for Jean Dybowski.

† **Dynamopterus** MILNE-EDWARDS, Comptes-Rendus Second Congrès Ornith. Int., II, 1892, p. 64.

Type, *Dynamopterus velox* Milne-Edwards.....[*Cuculidæ*.]

Δύναμις, power, force; *πτερόν*, wing.

Ecmeles GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. ix.

New name for *Hydrocorax* Vieillot.....[*Phalacrocoracidæ*.]

Ἑκμελής, out of tune, irregular, unbridled.

Einalia HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 358.

New name for *Laroides* Brehm, on grounds of purism.

[*Laridæ*.]

Εἰνάλιος, of the sea.

Elachura OATES, Fauna of Brit. India (Birds), I, Dec., 1889, p. 339.

Type, *Troglodytes punctatus* Blyth.....[*Troglodytidæ*.]

(see *Spiloptera*.)

Ἐλαχύς, small; *ὀπρά*, tail.

† **Elaphrocnemus** MILNE-EDWARDS, Comptes-Rendus Second Congrès Ornith. Int., II, 1892, p. 77.

Type, *Elaphrocnemus phasianus* Milne-Edwards (first species mentioned).....[*Ralliformes*.]

Ελαφρός nimble, swift; *κνήμη*, the leg.

Elasas HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 263.

New name for *Elanoides* Vieillot, on grounds of purism.

[*Falconidæ*.]

'Ελασᾶς, an unknown bird.

Elasmonetta SALVADORI, Catal. Birds Brit. Mus., XXVII, 1895, p. 287.

Type, *Anas chlorotis* Gray -----[*Anatidæ*.]

'Ελασμός, a thin plate; νῆπτα, a duck.

Elathea GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. viii.

New name for "*Brachypus* Gould" -----[*Pycnonotidæ*.]

Electron GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. viii.

New name for "*Crypticus* Bonaparte" -----[*Momotidæ*.]

"Ηλεκτρον, something bright and beaming.

†**Elornis** AYMARD, Congrès Sci. de France, 1856, I, p. 234.

Type, *Elornis antiquus* Aymard -----[*Phenicopteridæ*.]

"Ελος, low ground bordering rivers, a marsh; ὄρνις, a bird.

Emarginata SHELLEY, Birds of Africa, I, 1896, p. 89.

Type, *Luscinia sinuata* Sundevall -----[*Turdidæ*.]

Emarginatus, emarginate.

†**Enaliornis** SEELEY, Index to Fossil Remains of Aves, etc., 1869, p. xvii (*nomen nudum* here); Quart. Journ. Geol. Soc., XXXII, 1876, pp. 496-510.

New name for *Pelagornis* Seeley (not Lartet).-[*Enaliornithidæ*.]

'Ενάλιος, living in the sea; ὄρνις, bird.

Endomychura OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 201.

New name for *Micruria* Grant, preoccupied -----[*Alcidæ*.]

'Ενδόμυχος, concealed; οὐρά, tail.

Entomyzon SWAINSON, Zool. Journ., I, Jan., 1825, p. 480 (note).

Type, the "blue-faced Grackle of Latham" (= *Gracula cyanotis* Latham) -----[*Meliphagidæ*.]

'Εντός, within, inside; μύζω, I suck.

Enygrotheres HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 353.

New name for *Sticticarbo* Bonaparte, on grounds of purism.

[*Phalacrocoracidæ*.]

"Ενυγρος, in the water, aquatic; θηράω, I hunt, pursue.

†**Eoneornis** AMEGHINO, Bol. Inst. Geogr. Argentino, XV, 1895, p. 593.

Type, *Eoneornis australis* Ameghino -----[*Anatidæ*.]

'Ηώς, dawn, νέος, new; ὄρνις, bird.

Eremiornis NORTH, Victorian Naturalist, XVII, Aug., 1900, p. 78.

Type, *Eremiornis carteri* North -----[*Timaliidæ*.]

'Ερημία, desert; ὄρνις, bird.

Eremopterix KAUP, Thierreich, II, Pt. 1, 1836, p. 139.

Type, *Fringilla otolencus*, *F. cruciger* Temminck. [Alaudidæ.]

Eribates RIDGWAY, Proc. U. S. Nat. Mus., XVI, Oct. 25, 1893, p. 606.

Type, *Myiobius magnirostris* Gray. [Tyrannidæ.]

(A subgenus of *Myiarchus*.)

Ἐρι, intensive particle; βάτης, one that treads or covers.

Erythrobucco SHELLEY, Ibis, ser. 6, I, Oct. 1889, p. 475.

Type, *Pogonias rolleti* Defilippi. [Capitonidæ.]

Ἐρυθρός, red; + Bucco (*bucco*, a babbling, foolish fellow).

Erythrocnus SHARPE, Bull. Brit. Orn. Club, iii, Apr. 30, 1894, p. xxxix.

Type, *Ardea rufiventris* Sundevall. [Ardeidæ.]

Ἐρυθρός, red; ὄκνος, bittern.

Erythrolimnas HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 320.

New name for *Rufirallus* Bonaparte, on grounds of purism.

[Rallidæ.]

Ἐρυθρός, red; λιμνᾶς (λιμναῖος) marshy, of the mere.

Erythrophoyx SHARPE, Bull. Brit. Orn. Club, III, Apr. 30, 1894, p. xxxviii.

Type, *Ardeiralla woodfordi* Grant. [Ardeidæ.]

Ἐρυθρός, red; φῶνξ, a kind of heron.

Erythrotriorchis "GURNEY MS.", SHARPE, Proc. Zool. Soc. Lond., 1875, p. 337.

Type, *Falco radiatus* Latham. [Falconidæ.]

Ἐρυθρός, red; τριτορχος, a kite.

Etoimus GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. x.

New name for *Mirafra* Horsfield. [Alaudidæ.]

Ἐτοῖμος, ready, prepared, real, actual.

Eucorax SHARPE, Bull. Brit. Orn. Club, IV, Dec. 29, 1894, p. xv.

Type, *Manicodia comrii* Selater. [Paradisidæ.]

Εὖ, well; κόραξ, a raven.

Eugralla LESSON, Actes Soc. Linn. Bordeaux, XII, no. 41, Sept., 1842, p. 197.

Type, *Troglodytes paradoxus* Kittlitz. and *Megalonyx nanus* Lesson. Should replace *Triptorhynchus*. [Pteroptochidæ.]

(A subgenus of *Megalonyx*.)

Euhierax WEBB and BERTHELOT, Hist. Nat. Canaries, II, Ornith., 1838-1844, p. 5.

Type, *Falco peregrinus* Linnaeus (first species mentioned).

[Falconidæ.]

Εὖ, well; ἱέραξ, a hawk.

Euhyas SHARPE, Catal. Birds Brit. Mus., XXIV, 1896, p. 736.

New name for *Eurypterus* Sharpe, preoccupied (see *Zapterus*).

[*Charadriidæ*.]

Eὐ̄, well; + *Hyas*.

Eulacestoma DE VIS, Ann. Report Brit. New Guinea (1893-94), 1894, App. EE, p. 102.

Type, *Eulacestoma nigropectus* De Vis [*Laniidæ*.]

Εὐλάκα, a plowshare; *στόμα*, mouth.

Eulipoa GRANT, Catal. Birds Brit. Mus., XXII, 1893, p. 462.

Type, *Megapodius wallacei* Gray [*Megapodidæ*.]

Eὐ̄, well; + *Lipoa*.

Eumathes HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 110.

New name for *Mino* Lesson, on grounds of purism. [*Sturnidæ*.]

Εὐμαθής, quick at learning.

† **Eupterornis** LEMOINE, Recher. Ois. Foss. Environs de Reims, Pt. 1, 1878, p. 56.

Type, *Eupterornis remensis* Lemoine [*Incertæ sedis*.]

Eὐ̄, well; *πτερόν*, wing; *ὄρνις*, bird.

Eurhinospiza OUSTALET, Ann. Sci. Nat. (Zool.), ser. 7, XII, 1891, p. 293.

Type, *Eurhinospiza henrici* Oustalet [*Fringillidæ*.]

Eὐ̄, well; *ῥίς* (*ῥιν*-), nose; *σπίζα*, finch.

Eurillas OBERHOLSER, Proc. U. S. Nat. Mus., XXII, Oct. 7, 1899, p. 15.

Type, *Andropadus virens* Cassin [*Timaliidæ*.]

Εὐρύς, broad; *ἰλλάς*, a thrush.

† **Euryonotus** MERCERAT, Anales Soc. Cientifica Argentina, XLIII, No. V, May, 1897, p. 238.

Type, *Euryonotus brachypterus* Mercerat (first species mentioned) [*Rallidæ*?]

Εὐρύς, broad; *νωτός*, back.

Eurypterus SHARPE, Catal. Birds Brit. Mus., XXIV, 1896, p. 171.

Type, *Charadrius leucurus* Lichtenstein (see *Euhyas*).

[*Charadriidæ*.]

Εὐρύς, broad; *πτερόν*, wing.

† **Eutelornis** AMEGHINO, Bol. Inst. Geogr. Argentino, XV, 1895, p. 594.

Type, *Eutelornis patagonicus* Ameghino [*Anatidæ*.]

Εὐτελής, cheap, paltry, worthless; *ὄρνις*, bird.

Falcinellus CUVIER, Règne Animal, I, 1817, p. 486.

Type, *Scolopax pygmaea* Gmelin [*Scolopacidæ*.]

Falcinellus, dim. of *fala*, a sickle.

Fedoa STEPHENS, General Zoology, XII, Pt. 1, 1824, p. 70.

Type, *Fedoa americana* Stephens (= *Scolopax fedoa* Linnæus).

[*Scolopacidæ*.]

- † **Filholornis** MILNE-EDWARDS, Comptes-Rendu Second Congrès Ornith. Int., II, 1892, p. 67.
 Type, *Filholornis paradoxa* Milne-Edwards (first species mentioned) -----[*Incertæ sedis*.]
 Named for M. Henri Filhol.
- † **Flacourtia** ANDREWS, Novitates Zoologicae, II, Feb. 1, 1895, p. 25.
 Type, *Mullerornis rudis* Milne-Edwards and Grandidier.
 [*Æpyornithidæ*.]
 Named for Étienne de Flacourt, an early governor of Madagascar.
- † **Foetopterus** MORENO and MERCERAT, Anales Mus. La Plata (Paleon. Argén., I), 1891, p. 66.
 Type, *Foetopterus ambiguus* Moreno and Mercerat. --[*Falconidæ*.]
 ? *Fœtus*, offspring; *περόν*, wing.
- Formicicapa** DAUDIN, Ann. Mus. d'Hist. Nat., III, 1804, p. 146 (*nomen nudum* here?)
 Type, "*Gobe-fourmi*" (a *nomen nudum* here?) --[*Formicariidæ*.]
Formica, an ant; *capere*, to take.
- Galeolimnas** HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 320.
 New name for *Mustelirallus* Bonaparte, on grounds of purism.
 [*Rallidæ*.]
Γαλέν, a weasel; *λιμνάς*, of the mere, marshy.
- Galeopsar** SHARPE, Ibis, ser. 6, III, Apr., 1891, p. 241.
 Type, *Galeopsar salvadorii* Sharpe -----[*Sturnidæ*.]
Γαλέν, a weasel; *ψάρ*, starling.
- Galeripitta** ELLIOT, Monogr. Pittidæ, ed. 2, Pt. 5, 1895, p. xvii (introd.).
 Type, *Pitta cucullata* Hartlaub -----[*Pittidæ*.]
 (A subgenus of *Pitta*.)
Galerum, a helmet; + *Pitta*.
- Galgulus** WAGLER, Systema Avium, I, 1827, p. 326.
 Type, *Corvus gymnocephalus* Temminck -----[*Corvidæ*.]
Galgulus, a name applied to a thrush-like bird.
- Gallina** LINNÆUS, in Hasselquist, Reise nach Palæstina, 1762, p. 327.
 Type, *Phasianus meleagris* Linnæus -----[*Phasianidæ*.]
Gallina, a hen, fowl.
- † **Gallinuloides** EASTMAN, Geol. Mag., Feb., 1900, p. 54.
 Type *Gallinuloides wyomingensis* Eastman. --[*Rallidæ*(= *Craces*).]
Gallinula, + *εἶδος*, form.
- Gambetta** KAUP, Natürl. Syst., 1829, p. 54.
 Type, *Tringa calidris* Linnæus -----[*Scolopacidæ*.]
Gambetta, an Italian name for a sandpiper.
- Gavia**. Gloger, Hand-und Hilfsbuch, I, 1842, p. 433.
 New name for *Vanellus* Brisson -----[*Charadriidæ*.]

Geniates HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 225.

New name for *Chotorea* Bonaparte, on grounds of purism.

[*Capitonidæ*.]

Γενειάτης, bearded.

Gennadas HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 262.

New name for *Gennaia* Kaup, 1847, (not *Gennæus* Wagler, 1832).

[*Falconidæ*.]

Γεννάδας, of noble birth.

Gennaeochen HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 343.

New name for *Radjah* Reichenbach, on grounds of purism.

[*Anatidæ*.]

Γενναῖος, high born; χήν, goose.

†**Genyornis** STIRLING and ZEITZ, Trans. Roy. Soc. S. Austr., XX, 1896, p. 171.

Type, *Genyornis newtoni* Stirling and Zeitz. [*Dromornithidæ*.]

Γένυς, chin, jaw; ὄρνις, bird.

Geospiza GLOGER, Hand-und Hilfsbuch, I, 1842, p. 254.

Type, *Fringilla nivalis* Linnæus. [*Fringillidæ*.]

†**Geranopsis** LYDEKKER, Catal. Fossil Birds Brit. Mus., 1891, p. 166.

Type, *Geranopsis hastingiæ* Lydekker. [*Gruvidæ*.]

Γέρανος, a crane; ὄψις, aspect.

†**Geranopterus** MILNE-EDWARDS, Compte-Rendu Second Congrès Ornith. Int., II, 1892, p. 66.

Type, *Geranopterus alatus* Milne-Edwards. [*Coraciidæ*.]

Γέρανος, a crane; πτερόν, wing.

Glaucorodius HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 307.

New name for *Florida* Baird, on grounds of purism. [*Ardeidæ*.]

Γλαυκός, bluish green, gray; ἐρωδιός, a heron.

Gmelinius BOUCARD, Genera of Humming Birds (in Humming Bird, IV, Pt. 1), Mar., 1894, p. 108.

Type, *Trochilus bicolor* Gmelin. [*Trochilidæ*.]

Named for Johann Friedrich Gmelin.

Granatina SHARPE, Catal. Birds Brit. Mus., XIII, 1890, p. 403.

Type, *Fringilla granatina* Linnæus. [*Ploceidæ*.]

Granatīna, dim. of *granatus*.

Gripeus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 352.

New name for “*Graculus* Rehb., 1853” (type, *Pelecanus graculus*

Linnæus). [*Phalacrocoracidæ*.]

Γριπέύς, a fisherman.

†*Griphornis* OWEN MS., Woodward, Intellectual Observer, II, Dec., 1862, p. 317.

Type, *Griphornis longicaudatus* Owen MS., Woodward.

[*Archæopteryges*.]

Γρῖφος, riddle; ὄρνις, bird.

†*Griphosaurus* WAGNER, Sitzungsberichte bay. Akad., II, 1861, p. 153.

Type, *Griphosaurus* (= *Archæopteryx*) [*Archæopteryges*.]

Γρῖφος, riddle; σαῦρος, a lizard.

Gymnocrotaphus BÜTTIKOFER, Notes Leyden Mus., XVII, June 9, 1896, p. 245.

Type, *Brachypus tygus* Bonaparte (see *Bonapartia*).

[*Timaliidæ*.]

Γυμνός, naked; κρόταφος, side of the face.

Gymnogyps LESSON, L'Écho du Monde Savant, ser. 2, VI, Dec. 8, 1842, col. 1037.

Type, *Vultur californianus* Shaw [*Cathartidæ*.]

(A subgenus of *Vultur*).

Γυμνός, naked; γύψ, a vulture.

Gymnolæmus GRANT, Catal. Birds Brit. Mus., XVII, 1892, p. 370.

Type, *Anthracoceros marchii* Oustalet [*Bucerotidæ*.]

Γυμνός, naked; λαιμός, throat, gullet.

Gymnops SPIX, Avium Species Novæ, I, 1824, p. 10.

Type, *Gymnops fasciatus* Spix [*Falconidæ*.]

Γυμνός, naked; ὤψ, face.

Hagiopsar SHARPE, Catal. Birds Brit. Mus., XIII, 1890, p. 168.

Type, *Amydrus tristrami* Selater [*Sturnidæ*.]

"*Άγιος*, sacred; ψάρ, starling.

Halinertus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 267.

New name for *Haliastur* Selby, on grounds of purism.

[*Falconidæ*.]

"*Άλιος*, of the sea; νέπτος, a bird of prey.

Halobates GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. ix.

New name for *Hydrobates* Boie [*Procellariidæ*.]

Haploenas HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 278.

New name for *Turacana* Bonaparte, on grounds of purism.

[*Columbidæ*.]

"*Απλός*, simple, plain; οινάς, a wild pigeon.

Haplopyga HEUGLIN, Nachträge und Bericht. zur Ornith. Nordost-Afrika's, 1871, p. cxxxvi.

Type, *Loria astrild* Linnaeus [*Ploceidæ*.]

"*Απλός*, simple; πυγή, rump.

Heliobucco SHELLEY, Ibis, ser. 6, I, Oct., 1889, p. 476.

Type, *Gymnobucco bonapartii* Hartlaub [*Capitonidæ*.]

"*Ἡλιος*, the sun; + *Bucco*.

Heliocorys SHARPE, Catal. Birds Brit. Mus., XIII, 1890, p. 623.

Type, *Galerida modesta* Heuglin [*Alaudidæ*.]

"*Ἡλιος*, the sun; *κόρυς*, a lark.

Heliopais SHARPE, Bull. Brit. Orn. Club, I, Mar. 28, 1893, p. xxxvii.

Type, *Podica personata* Gray [*Heliornithidæ*.]

"*Ἡλιος*, sun; *παῖς*, a child.

Hemithraupis RIDGWAY, Auk, XV, July (May 13), 1898, p. 226.

Type, *Aglaia cyanocephala* Lafresnaye [*Tanagridæ*.]

"*Ἡμισυς* (*ἡμι*-), half; *θραυπίς*, a small bird.

Herophilus GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. viii.

New name for *Cecropis* Boie [*Hirundinidæ*.]

"*Ἡρώς*, a hero; *φίλος*, loving.

Heterhyphantes SHARPE, Catal. Birds Brit. Mus., XIII, 1890, p. 414.

Type, *Malimbus nigricollis* Vieillot (first species mentioned).

[*Ploceidæ*.]

"*Ἑτερος*, other, different; + *Hyphantes* (*ὕφάντης*, a weaver).

Heterocnus SHARPE, Bull. Brit. Orn. Club, V, Dec. 30, 1895, p. xiv.

Type, *Tigrisoma cabanisi* Heine [*Ardeidæ*.]

"*Ἑτερος*, different; *ὄκνος*, a bittern.

Heteropsar SHARPE, Catal. Birds Brit. Mus., XIII, 1890, p. 185.

Type, *Lamprocolinus acuticaudus* Bocage (first species mentioned) [*Sturnidæ*.]

"*Ἑτερος*, different; *ψάρ*, starling.

Heteroptilorhis SHARPE, Monogr. Paradiseidæ, Pt. 8, 1898, p. x.

Type, *Craspedophora mantoui* Oustalet [*Paradiseidæ*.]

"*Ἑτερος*, different; + *Ptilorhis* (*πτίλον*, a feather; *ῥίς*, nose).

Heterospingus RIDGWAY, Auk, XV, July (May 13), 1898, p. 225.

Type, *Tachyphonus rubrifrons* Lawrence [*Tanagridæ*.]

"*Ἑτερος*, different; *σπίγγος* (= *σπίνος*), a small bird, a finch.

Heterotetrax SHARPE, Catal. Birds Brit. Mus., XXIII, 1894, p. 296.

New name for *Heterotis* Sharpe, preoccupied [*Otididæ*.]

"*Ἑτερος*, different; + *Tetrax* (*τέτραξ*, a pheasant).

Heterotis SHARPE, Bull. Brit. Orn. Club, I, June 1, 1893, p. 1.

Type, *Otis vigorsi* Smith (see *Heterotetrax*) [*Otididæ*.]

"*Ἑτερος*, different; + *Otis* (*ὄρίς*, a kind of bustard).

Heterotrogon RICHMOND, Proc. U. S. Nat. Mus., XVII, May 11, 1895, p. 602.

Type, *Hapaloderma vittatum* Shelley [*Trogonidæ*.]

"*Ἑτερος*, different; + *Trogon*.

Hilarocichla OATES, Fauna British India (Birds), I, Dec., 1889, p. 243.

Type, *Pteruthius rufiventris* Blyth [*Muscicapidæ*.]

Ἠλαρός, cheerful, gay; κίχλη, a thrush.

"*Hirundolanus* Clarke." This name is referred to by Count Salvadori as having been omitted from Waterhouse's "Index." It, however, appears to have no standing; it was not printed in the Trans. N. Z. Inst., XIII, 1881, p. 454, and was quoted by Buller (Birds New Zealand, ed. 2, I, 1888, p. 119) only to be discredited.

Histriophaps SALVADORI, Catal. Birds Brit. Mus., XXI, 1893, p. 529.

Type, *Columba histrionica* Gould [*Peristeridæ*.]

Histrion, an actor; + *Phaps* (φάψ, a pigeon).

Homopelia SALVADORI, Catal. Birds Brit. Mus., XXI, 1893, p. 409.

Type, *Columba picturata* Temminck [*Peristeridæ*.]

(A subgenus of *Turtur*.)

Ομός, the same, like; πέλεια, a dove.

Horizocerus OBERHOLSER, Proc. U. S. Nat. Mus., XXII, Oct. 9, 1899, p. 28.

Type, *Toccus hartlaubi* Gould [*Bucerotidæ*.]

Ὀπίζω, I limit; κέρας, a horn.

Horizopus OBERHOLSER, Auk, XVI, Oct., 1899, p. 331.

New name for *Contopus* Cabanis, 1855, not *Contipus* de Mar-seul, 1853 [*Tyrannidæ*.]

Ὀπίζω, I limit; πούς, foot.

Horizorhinus OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 216.

New name for *Cuphopterus* Hartlaub, preoccupied [*Turdidæ*.]

Ὀπίζω, I limit; ρίς, nose.

Houbaropsis SHARPE, Bull. Brit. Orn. Club, I, June 1, 1893, p. 1.

Type, *Otis bengalensis* Gmelin [*Otididæ*.]

Houbara, native name of a bustard; + ὄψις, aspect.

Houppifer GUÉRIN-MÉNEVILLE, Icon. Règne Anim. Ois., 1829-1838, p. 26.

Type, *Phasianus erythrophthalmus* Raffles [*Phasianidæ*.]

Houpe, tuft, topknot; *fero*, to bear.

Hydranassa HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 306.

Type, *Ardea rufa* Boddaert [*Ardeidæ*.]

Ἵδωρ (ὕδρ-), water; ἄνασσα, queen.

Hydrobates TEMMINCK, Planches Coloriées, V (livr. 68), 1826, pl. 406.

Type, *Anas lobata* Shaw [*Anatidæ*.]

Hydrocorax VIEILLOT, Analyse, Apr., 1816, p. 63.

Type, "*Cormoran* Buff." (= *Pelecanus carbo* Linnæus).

[*Phalacrocoracidæ*.]

Ἵδωρ (ὕδρ-), water; κόραξ, a raven.

Hyetoceryx HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 336.

New name for *Pluviorhynchus* Bonaparte, on grounds of purism.
[*Charadriidæ*.]

Ἑτός, rain; κήρυξ, herald.

Hylaërops GLOGER, Hand-und Hilfsbuch, I, 1842, p. xxxv.

Type, *Galbula tridactyla* Vieillot.....[*Galbulidæ*.]

Hylike GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. ix.

New name for *Leistes* Vigors.....[*Icteridæ*.]

Ἑλική, material, worldly.

Hylorchilus NELSON, Auk, XIV, Jan., 1897, p. 71.

Type, *Catherpes sumichrasti* Lawrence.....[*Troglodytidæ*.]

Ἑλη, forest; ὀρχίλος, wren.

Hyperanthus GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. ix.

New name for *Euplectes* Swainson.....[*Ploceidæ*.]

Ἑπέρ, over, excess; ἄνθος, a flower, gay color.

Hyphantospiza REICHENOW, Berichte Allgem. Deutsche Ornith. Ges., Feb., 1892, p. 6.

Type, *Coccothraustes olivaceus* Fraser.....[*Fringillidæ*.]

Ἑφάντης, a weaver; σπιζα, finch.

Hypocharmosyna SALVADORI, Catal. Birds Brit. Mus., XX, 1891, p. 72.

Type, *Psittacus placensis* Temminck.....[*Loriidæ*.]

Ἑπό, under; + *Charmosyna* (χαρμόσυνος, joyful, glad).

Hypocrites GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. ix.

New name for *Kittacincla* Gould.....[*Timaliidæ*.]

Ἑποκριτής, one who answers, an interpreter, an actor.

†**Hypselornis** LYDEKKER, Catal. Fossil Birds Brit. Mus., 1891, p. 354.

Type, *Hypselornis sivalensis* Lydekker.....[*Casuariidæ*.]

Ἑψηλός, lofty, towering; ὄρνις, bird.

†**Ibidopsis** LYDEKKER, Catal. Fossil Birds Brit. Mus., 1891, p. 74.

Type, *Ibidopsis hordwelliensis* Lydekker.....[*Plataleidæ*.]

Ἰβίς (ιβιδ-), ibis; ὄψις, appearance.

†**Idiornis** OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 202.

New name for *Orthocnemus* Milne-Edwards, preoccupied.

[*Incertæ sedis*.]

Ἰδιος, distinct; ὄρνις, bird.

Ifrita ROTHSCILD, Bull. Brit. Orn. Club, VII, May 25, 1898, p. liii.

Type, *Ifrita coronata* Rothschild.....[*Timaliidæ*.]

Ἰφρίτ, a demon (Arabian).

Ilyonetta HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 347.

New name for *Nyroca* Fleming, on grounds of purism.

[*Anatidæ*.]

Ἰλὺς, mud; νῆττα, a duck.

Incaspiza RIDGWAY, Auk, XV, July (May 13), 1898, p. 224.

Type, *Aimophila pulchra* Sclater [*Fringillidæ*.]

Inca, an ancient Peruvian; σπιζα, finch.

Insignipitta ELLIOT, Monogr. Pittidæ, ed. 2, Pt. 5, 1895, p. xviii (introd.).

Type, *Pitta ellioti* Oustalet [*Pittidæ*.]

(A subgenus of *Pitta*.)

Insignis, notable; + *Pitta*.

Ipnodorus GLOGER, Hand- und Hilfsbuch, I, 1842, p. 304.

Type, *Turdus figulus* Lichtenstein [*Furnariidæ*.]

Ἰπνός, an oven; δόμος, house.

Itys WAGLER, Isis, 1831, p. 535.

New name for *Ocypetes* Wagler (not *Ocypeta* Leach, 1814).

[*Thinocoridæ*.]

Ixidia BLYTH, Journ. Asiat. Soc. Bengal, XV, 1846, p. 50.

New name for *Ixodia* Blyth [*Timaliidæ*.]

Ixodes BLYTH, Journ. Asiat. Soc. Bengal, XV, 1846, p. 50.

Type, same as *Ixodia* Blyth? [*Timaliidæ*.]

Ἰξώδης, like birdlime; stingy.

Jaco LESSON, Manuel d'Ornithologie, II, June, 1828, p. 151; De Filippi, Museum Mediolanense, 1847, p. 20.

Type, "*Le perroquet gris*" (= *Psittacus erythacus* Linnæus).

[*Psittacidæ*.]

(A subgenus of *Psittacus*.)

Jaco, a poll parrot (French).

Janthothorax BÜTTIKOFER, Notes Leyden Museum, XVI, Mar. 15, 1895, p. 163.

Type, *Janthothorax bensbachii* Büttikofer [*Paradiseidæ*.]

Ἰαν, violet; ἄνθος, flower; θώραξ, breastplate.

Jonocicca SALVADORI, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, III, 1887, p. 236.

Type, *Porphyrio alleni* Thomson [*Rallidæ*.]

Ἰαν, violet; κίκκα, cock.

Kakatoe CUVIER, Leçons d'Anatomie Comparée, I, Apr., 1800, 2d tableau.

Type, "*Kakatoës*" [*Cacatridæ*.]

Kakatoës, cockatoo (French).

Kittlitzia HARTERT, Katalog Vogelsammlung Mus. Senckenb., 1891, p. 75.

Type, *Calornis corvina* Kittlitz [*Sturnidæ*.]

Named for Friedrich von Kittlitz.

Kittlitzia HARTLAUB, Abhandl. Nat. Ver. Bremen, XII, 1892, p. 391.

Type, *Rallus monasa* Kittlitz (see *Aphanolinna*)... [*Rallidæ*.]

Named for Friedrich von Kittlitz.

Laceryzon HEINE, in Heine and Reichenow, Nomencl. Mus. Hein.

Orn., 1890, p. 109.

New name for *Gracupica* Lesson, on grounds of purism.

[*Sturnidæ*.]

Λακέρυζα, one that cries.

†**Lagopterus** MORENO and MERCERAT, Anales Mus. La Plata (Paleon.

Argen., I), 1891, p. 66.

Type, *Lagopterus minutus* Moreno and Mercerat... [*Falconidæ*.]

(See *Asthenopterus*.)

Lambruschinia SALVADORI, Atti Soc. Ital. Sci. Nat., VI, 1864, p. 487.

Type, *Larus gelastes* Lichtenstein... [*Laridæ*.]

Named for Luigi (?) Lambruschini.

Lamprothorax Meyer, Abhandl. und Berichte Mus. Dresden, V, No. 2,

1894, p. 3.

Type, *Lamprothorax wilhelminæ* Meyer... [*Paradisæidæ*.]

Λαμπρός, shining; *θώραξ*, breastplate.

Lanioturdinus BÜTTIKOFER, Notes Leyden Museum, XVII, 1895,

p. 72.

Type, *Corythocichla crassa* Sharpe... [*Timaliidæ*.]

Lanius + *Turdinus*.

Laticauda¹ LESSON, L'Écho du Monde Savant, ser. 2, VIII, Oct. 22,

1843, col. 758.

Type, *Trochilus tyrianthinus* Loddiges... [*Trochilidæ*.]

(A subgenus of *Ornismyia*.)

Latus, broad; *cauda*, tail.

Lawrencius BOUCARD, Genera of Humming Birds (in Humming Bird,

IV, Pt. 3), Sept. 1894, p. 173.

Type, *Eupherusa cupreiceps* Lawrence... [*Trochilidæ*.]

Named for George Newbold Lawrence.

Lecythoplastes REICHENOW, Ornith. Monatsb., VI, July, 1898, p. 115.

Type, *Lecythoplastes preussi* Reichenow... [*Hirundinidæ*.]

Λήκυθος, an oil vase; *πλαστής*, a molder, modeler.

Leptomyza STEJNEGER, Standard Nat. History, IV (Birds), 1885, p. 535.

New name for *Leptornis* Hombron & Jacquinot, preoccupied.

[*Meliphagidæ*.]

Leptopelia HEINE, in Heine and Reichenow, Nomencl. Mus. Hein.

Orn., 1890, p. 283.

New name for *Talpacotia* Bonaparte, on grounds of purism.

[*Peristeridæ*.]

Λεπτός, delicate; *πέλεια*, a dove.

¹This name has priority over and should replace *Metallura* Gould, 1847.

Leptosittaca BERLEPSCH and STOLZMANN, Ibis, ser. 6, VI, July, 1894, p. 402.

Type, *Leptosittaca branickii* Berlepsch and Stolzmann.

[*Psittacidæ*.]

Λεπτός, delicate; *σιττάκη*, a parrot.

Leptourus SWAINSON, Birds of Western Africa, II, 1838, p. 184.

Type, *Zanclostomus flavirostris* Swainson ----- [*Cuculidæ*.]

(A subgenus of *Zanclostomus*.)

Leucocarbo BONAPARTE, Consp. Gen. Avium, II, 1855, p. 176.

Type, *Carbo bougainvillii* Lesson (first species mentioned).

[*Phalacrocoracidæ*.]

(A subgenus of *Urile*.)

Λευκός, white; + *Carbo* (*carbo*, coal, charcoal).

Leucænas SALVADORI, Catal. Birds Brit. Mus., XXI, 1893, p. 242.

Type, *Columba grisea* Gray ----- [*Columbidæ*.]

(A subgenus of *Columba*.)

Λευκός, white; *οινάς*, a wild pigeon.

Leucophoyx SHARPE, Bull. Brit. Orn. Club, III, Apr. 30, 1894, p. xxxix.

Type, *Ardea candidissima* Gmelin ----- [*Ardeidæ*.]

Λευκός, white; *φάωξ*, a species of heron.

Leucuria BANGS, Proc. Biol. Soc. Wash., XII, Oct. 31, 1898, p. 173.

Type, *Leucuria phalerata* Bangs ----- [*Trochilidæ*.]

Λευκός, white; *οὐρά*, tail.

Lignobucco REICHENOW, Journ. für Orn., July, 1887, p. 309.

Type, *Lignobucco consobrinus* Reichenow ----- [*Capitonidæ*.]

Lignum, wood; + *Bucco*.

Limnætus BOWDICH, Excursions in Madeira and Porto Santo, 1825, p. 56.

Type, the *Manta* (= *Falco buteo* Linnæus) ----- [*Falconidæ*.]

Λίμνη, a pool, marsh; *ἀετός*, eagle.

Limnogeranus SHARPE, Bull. Brit. Orn. Club, I, Mar. 28, 1893, p. xxxvii.

Type, *Ardea americana* Linnæus ----- [*Gruidæ*.]

Λίμνη, a pool, marsh; *γέρανος*, a crane.

Limoneres REICHENOW, Journ. für Orn., July, 1885, p. 372.

New name for *Dinemellia* Reichenbach, on grounds of purism.

[*Ploceidæ*.]

Λειμωνήρης, belonging to a meadow.

Lioparus OATES, Fauna Brit. India (Birds), I, Dec., 1889, p. 174.

Type, *Proparus? chrysæus* Hodgson ----- [*Timaliidæ*.]

Λεῖος, smooth; + *Parus* (a titmouse).

†*Liornis* AMEGHINO, Bol. Inst. Geogr. Argentino, XV, 1895, p. 570.

Type, *Liornis floweri* Ameghino ----- [*Stereornithes*.]

Λεῖος, smooth; *ὄρνις*, bird.

†*Liptornis* AMEGHINO, Bol. Inst. Geogr. Argentino, XV, 1895, p. 597.

Type, *Liptornis hesternus* Ameghino ----- [*Pelecanidæ?*]

†**Lithophaps** DE VIS, Proc. Linn. Soc. N. S. Wales, ser. 2, VI, Sept. 9, 1891, p. 121.

Type, *Lithophaps ulnaris* De Vis [*Treronidæ*.]
Λίθος, stone; *ψάψ*, a pigeon.

Lobibyx HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 334.

Type, *Tringa lobata* Latham [*Charadriidæ*.]

Loboparadisea ROTHSCILD, Bull. Brit. Orn. Club, VI, Dec. 30, 1896, p. xv.

Type, *Loboparadisea sericea* Rothschild [*Paradiseidæ*.]
Λοβός, a lobe; + *Paradisea*.

Lobospingus DE VIS, Ibis, ser. 7, III, July, 1897, p. 389.

Type, *Lobospingus sigillifer* De Vis [*Plöceidæ*.]
Λοβός, a lobe; *σπίγγος* (= *σπίνος*), a small bird, a kind of finch.

Lochmophasis HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 298.

New name for *Gallophasis* Hodgson, on grounds of purism.

[*Phasianidæ*.]

Λόχμη, a thicket; *φᾶσις*, the Phasian bird, pheasant.

†**Lophiornis** AMEGHINO, Revista Argentina Hist. Nat., I, Dec., 1891, p. 449.

Type, *Lophiornis obliquus* Ameghino [*Stereornithes*.]
Λοφία, a ridge, mane; *ὄρνις*, bird.

Lophobasileus PLESKE, Wiss. Result. Przew. Reis., Zool. Th., 1891, pp. 95-96.

Type, *Leptopæcile elegans* Przewalski [*Turdidæ*.]
Λόφος, crest; *βασιλεύς*, a king, prince.

Lophomyia FITZINGER, Sitzungs. Ak. Wissensch. Wien, XLVI, Pt. 1, 1863, p. 235.

Type, *Trochilus magnificus* Vieillot [*Trochilidæ*.]

Lophophalaris HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 317.

New name for *Lupha* Reichenbach, on grounds of purism.

[*Rallidæ*.]

Λόφος, crest; *φαλαρίς*, a coot.

Lophozosterops HARTERT, Novitates Zoologicae, III, Dec. 29, 1896, p. 567.

Type, *Lophozosterops dohertyi* Hartert [*Timaliidæ*.]
Λόφος, crest; + *Zosterops* (ζωστήρ, a girdle; ὤψ, eye).

Loria SALVADORI, Ann. Mus. Civ. Stor. Nat. Genova, ser. 2, XIV, May 15, 1894, p. 151.

Type, *Loria loriæ* Salvadori (= *Cnemophilus*?).

[*Ptilonorhynchidæ*.]

Named for Dr. Lamberto Loria.

†**Loxornis** AMEGHINO, Bol. Inst. Geogr. Argentino, XV, 1895, p. 595.

Type, *Loxornis clivus* Ameghino [Incertæ sedis.]

Λοξός, crosswise, slanting; ὄρνις, bird.

Lybius HERMANN, Tabula Affinitatum Animalium, 1783, pp. 217, 235.

Type, "*Le Guifso Balito*" Buffon (= *Loxia tridactyla* Gmelin).
[Capitonidæ.]

(See *Melanobucco*.)

Λιβύος, a kind of bird mentioned by Aristotle.

Lychnidospiza HEUGLIN, Nachträge und Bericht. zur Ornith. Nordost-Afrika's, 1871, p. cxxxvii.

Type, *Estrilda melanogaster* Heuglin [Ploceidæ.]

Λυχνίς (λυχνιδ-), a plant with a bright scarlet flower; πιζα, a finch.

Lysurus RIDGWAY, Auk, XV, July (May 13), 1898, p. 225.

Type, *Buarremon crassirostris* Cassin [Fringillidæ.]

Λύειν (λυσ-), to loose; οὐρά, tail.

Macgregoria DE VIS, Ibis, ser. 7, III, Apr., 1897, p. 251.

Type, *Macgregoria pulchra* De Vis [Paradisæidæ.]

Named for Lady McGregor, wife of the first governor of British New Guinea.

Machlostomus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 228.

New name for *Tucaius* Bonaparte, on grounds of purism.

[Rampastidæ.]

Μάχλος, wanton, lustful; στόμα, mouth.

Malacorhynchus WAGLER, Isis, 1832, p. 1235.

Type, *Anas malacorhynchus* Forster [Anatidæ.]

Manikup DESMAREST, Hist. Nat. Tangaras, etc., 1805, text to pl. 66.

Type, *Pipra albifrons* Gmelin [Formicariidæ.]

Manikin + *huppe*.

Marisca GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. viii.

New name for *Cossypha* Vigors [Timaliidæ.]

Marisca, a kind of fig.

†**Megalapteryx** HAAST, Trans. Zool. Soc. Lond., XII, Pt. 5, Dec., 1886, p. 161.

Type, *Megalapteryx hectori* Haast [Dinornithidæ.]

Μέγας (μεγαλ-), great; + *Apteryx* (ἄ, priv. + πτέρυξ, wing).

Melanobucco SHELLEY, Ibis, ser. 6, I, Oct., 1889, p. 476.

Type, *Bucco bidentatus* Shaw (= *Lybius* Hermann).

[Capitonidæ.]

Μέλας (μελαν-), black; + *Bucco*.

Melanocarbo BERNSTEIN, in Musschenbroek, Dagboek van Dr. H. A. Bernstein's laatste Reis van Ternate, etc., 1883, p. 119.

Type, *Hydrocorax melanoleucus* Vieillot [Phalacrocoracidæ.]

Μέλας (μελαν-), black; + *Carbo* (*carbo*, coal, charcoal).

Melanolarus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 359.

New name for *Melagavia* Bonaparte, on grounds of purism.

[*Laridæ*.]

Μέλας (μελαν-), black; + *Larus* (λάρος, a gull).

Melanophoyx SHARPE, Bull. Brit. Orn. Club, III, Apr. 30, 1894, p. xxxviii.

Type, *Ardea calceolata* Du Bus (= *Ardea ardesiaca* Wagler).

[*Ardeidæ*.]

Μέλας (μελαν-), black; *φάωξ*, a species of heron.

Melanospiza RIDGWAY, Proc. U. S. Nat. Mus., XIX, Mar. 15, 1897, p. 466 (note).

Type, *Loxia richardsoni* Cory [*Fringillidæ*.]

Μέλας (μελαν-), black; *σπιζα*, a finch.

Melanosterna BLYTH, Journ. Asiat. Soc. Bengal, XV, 1846, p. 373.

Type, *Sterna anæthetus* Scopoli [*Laridæ*.]

Μέλας (μελαν-), black; + *Sterna*.

Melignomon REICHENOW, Ornith. Monatsb., VI, Feb., 1898, p. 22.

Type, *Melignomon zenkeri* Reichenow [*Indicatoridæ*.]

Μέλι, honey; *γνώμων*, an inspector, guardian.

Melopitta STEJNEGER, Standard Nat. History, IV (Birds), 1885, p. 466.

New name for *Melanpitta* Schlegel, preoccupied [*Pittidæ*.]

(See *Coracocichla*.)

Mel (mell-), honey; + *Pitta*.

† **Mesembriornis** MORENO, Breve Reseña Prog. Mus. La Plata, segundo semestre 1888, 1889, p. 29.

Type, *Mesembriornis milne-edwardsii* Moreno .. [*Stereornithes*.]

Μεσημβρία, the south; *ὄρνις*, bird.

Mesolophus BÜTTIKOFER, Notes Leyden Museum, XVII, June 9, 1896, p. 247.

Type, *Vanga flaviventris* Tickell [*Timaliidæ*.]

Μέσος, middle; *λόφος*, crest.

Mesophoyx SHARPE, Bull. Brit. Orn. Club, III, Apr. 30, 1894, p. xxxviii.

Type, *Ardea intermedia* Wagler. [*Ardeidæ*.]

Μέσος, middle; *φάωξ*, a species of heron.

† **Mesopteryx** HUTTON, Trans. New Zealand Inst., XXIV, May, 1892, p. 129.

Type, *Dinornis didiiformis* Owen [*Dinornithidæ*.]

Μέσος, middle; + *Apteryx* (ἄ, priv. + *πτέρυξ*, wing).

Mesoscolopax SHARPE, Catal. Birds Brit. Mus., XXIV, 1896, p. 371.

Type, *Numenius minutus* Gould [*Scolopacidæ*.]

Μέσος, middle; + *Scolopax* (σκολόπαξ, a woodcock).

Metallococcyx REICHENOW, Ornith. Monatsb., IV, Apr., 1896, p. 54.

Type, *Cuculus smaragdinus* Swainson [*Cuculidæ*.]

Μέταλλον, a metal; *κόκκυξ*, a cuckoo.

†**Metapteryx** DE VIS, Proc. Linn. Soc. N. S. Wales, ser. 2, VI, May 23, 1892, p. 453.

Type, *Metapteryx bifrons* De Vis [Apterygidae.]

Μετά, beyond; + *Apteryx* (ἀ, priv. + πτέρυξ, wing).

Mezobucco SHELLEY, Ibis, ser. 6, I, Oct., 1889, p. 477.

Type, *Bucco dunauceli* Lesson [Capitonidae.]

Μέσος, middle; + *Bucco*.

Mezotreron SHARPE, Hand-list of Birds, I, 1899, p. 56.

Type, *Ptilopus dohertyi* Rothschild [Treronidae.]

Μέσος, middle; + *Treron* (τρήρων, a dove).

Micranous SAUNDERS, Bull. Brit. Orn. Club, IV, Jan. 29, 1895, p. xix.

Type, *Sterna tenuirostris* Temminck [Laridae.]

Μικρός, small; + *Anous* (ἄνοος, silly, stupid).

Micropelia HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 283.

New name for *Scardafella* Bonaparte, on grounds of purism.

[Peristeridae.]

Μικρός, small; πέλεια, a dove.

Microsarcopteryx SHARPE, Catal. Birds Brit. Mus., XXIV, 1896, p. 133.

Type, *Pluvianus cinerea* Blyth [Charadriidae.]

Μικρός, small; σάρξ, flesh; ὤψ, face.

Microstictus HARGITT, Catal. Birds Brit. Mus., XVIII, 1890, p. 489.

New name for *Lichtensteinipicus* Bonaparte, on grounds of purism [Picidae.]

Μικρός, small; στικτός, marked, spotted.

Microtribonyx SHARPE, Bull. Brit. Orn. Club, I, Jan. 26, 1893, p. xxix.

Type, *Gallinula ventralis* Gould [Rallidae.]

Μικρός, small; + *Tribonyx* (τρίβειν, to rub; ὄνυξ, claw).

Micruria GRANT, Catal. Birds Brit. Mus., XXVI, 1898, p. 594.

Type, *Brachyramphus hypoleucus* Xantus (first species mentioned). (See *Endomychura*) [Alcidae.]

Μικρός, small; + *Uria*.

†**Milnea** LYDEKKER, Catal. Fossil Birds Brit. Mus., 1891, p. 169.

Type, *Milnea gracilis* Lydekker [Edicnemidae.]

Named for Alphonse Milne-Edwards.

Mimetes GLOGER, Hand- und Hilfsbuch, I, 1842, p. 303.

New name for *Mimus* Boie [Mimidae.]

Μιμητής, an imitator.

Mitrospingus RIDGWAY, Auk, XV, July (May 13), 1898, p. 225.

Type, *Tachyphonus cassini* Lawrence [Tanagridae.]

Μίτρα, a miter; σπίνγος (= σπίνος), a kind of finch.

†**Moa** REICHENBACH, Nat. Syst. der Vögel, 1852, p. xxx.

Type, *Dinornis giganteus* Owen [Dinornithidae.]

Moa, its New Zealand name.

Monedula LINNÆUS, in Hasselquist, Reise nach Palästina, 1762, p. 294.

Type, *Upupa pyrrhonorax* Linnæus.....[*Corvidæ*.]

Monedula, a jackdaw.

Monilipitta ELLIOT, Monogr. Pittidæ, ed. 2, Pt. 5, 1895, p. xvii (introd.).

Type, *Pitta arquata* Gould.....[*Pittidæ*.]

(A subgenus of *Pitta*.)

Monile, a necklace, collar; + *Pitta*.

†**Movia** REICHENBACH, Nat. Syst. der Vögel, 1852, p. xxx.

Type, *Dinornis ingens* Owen.....[*Dinornithidæ*.]

From *Moa*, its New Zealand name.

Mülleria BÜTTIKOFER, Notes Leyden Museum, XVII, Aug., 1895, p. 96.

Type, *Napothera bivittata* Bonaparte.....[*Timaliidæ*.]

Named for Salomon Müller.

†**Mullerornis** MILNE-EDWARDS and GRANDIDIER, Comptes-Rendus Acad. Sci., CXVIII, 1894, p. 125.

Type, *Mullerornis betsilei* Milne-Edwards and Grandidier (first species mentioned).....[*Æpyornithidæ*.]

Named for M. Georges Muller.

Musciparus REICHENOW, Ornith. Monatsb., V, Feb., 1897, p. 25.

Type, *Musciparus tappenbecki* Reichenow.....[*Muscicapidæ*.]

Musca, a fly; + *Parus* (*parus*, a titmouse).

Mustoxydes GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. ix.

New name for *Francolinus* Stephens.....[*Phasianidæ*.]

Mychrorynchus LESSON, L'Écho du Monde Savant, ser. 2, VIII, Oct. 22, 1843, col. 756.

Type¹.....[*Trochilidæ*.]

Μικρός, small; *ρύγχος*, beak.

Myiopagis SALVIN and GODMAN, Biol. Centr.-Amer., Aves, II, Dec., 1888, p. 26.

Type, *Elainea placens* Selater.....[*Tyrannidæ*.]

Mvĩa, a fly; *παγίς*, a trap.

Myiosobus REICHENOW, Journ. für Orn., Apr., 1891, p. 210.

Type, *Myiosobus fulvicanda* Reichenow.....[*Muscicapidæ*.]

Mvĩa, a fly; *σοβέω*, to drive away.

Myospiza RIDGWAY, Auk, XV, July (May 13), 1898, p. 224.

Type, *Fringilla manimbe* Lichtenstein.....[*Fringillidæ*.]

Mũs, a mouse; *σπίζα*, a finch.

Myrmochanes ALLEN, Bull. Amer. Mus. Nat. Hist., II, Mar. 22, 1889, p. 95.

Type, *Myrmochanes hypoleucus* Allen.....[*Formicariidæ*.]

Μύρμηξ, an ant; *χαίνω*, I gape, yawn, snap.

¹Proposed as a subgenus or "race" of *Ornismyia*, with the following species: *O. heteropogon* Boissonneau, *O. iris* Lesson ("Or. cupripennis, Bourcier.???"), *O. phæbe* Lesson and Delattre, *O. rhami* Lesson, *O. parzudaki* Lesson, *O. michroryncha* Boissonneau.

Mystrorhamphus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 313.

New name for *Ajaja* Reichenbach, on grounds of purism.

[*Plataleidæ*.]

Μύστρον, a spoon; *δάμφος*, bill.

Myza MEYER and WIGLESWORTH, Abhandl. und Berichte Mus. Dresden, V, no. 8, 1895, p. 11.

Type, *Myza sarasinorum* Meyer and Wiglesworth.

[*Meliphagidæ*.]

Μυζάω, I suck.

Nannochordeiles HARTERT, Ibis, ser. 7, II, July, 1896, p. 374.

Type, *Chordeiles pusillus* Gould -----[*Caprimulgidæ*.]

Νάννος, dwarf; + *Chordeiles* (*χορδή*, a harp string; *δειλη*, evening).

Nannopterum SHARPE, Hand-list of Birds, I, 1899, p. 235.

Type, *Phalacrocorax harrisi* Rothschild ----[*Phalacrocoracidæ*.]

Νάννος, dwarf; *πτερόν*, wing.

†**Necrastur** DE VIS, Proc. Linn. Soc. N. S. Wales, ser. 2, VI, May 23, 1892, p. 437.

Type, *Necrastur alacer* De Vis -----[*Falconidæ*.]

Νεκρός, dead; *astur*, a goshawk.

†**Necrobyas** MILNE-EDWARDS, Compte-Rendu Second Congrès Ornith. Int., II, 1892, p. 61.

Type, *Necrobyas harpax* Milne-Edwards (first species mentioned) -----[*Bubonidæ*.]

Νεκρός, dead; *βύας*, the owl.

†**Necropsar** "SLATER," A. GÜNTHER and E. NEWTON, Philos. Trans., 168, 1879, p. 427.

Type, *Necropsar rodericanus* "Slater," A. Günther and E. Newton -----[*Sturnidæ*.]

Νεκρός, dead; *ψάρ*, starling.

†**Necropsittacus** MILNE-EDWARDS, Ann. Sci. Nat. (Zool.), ser. 5, XIX, 1874, p. 18.

Type, *Psittacus rodericanus* Milne-Edwards -----[*Psittacidæ*.]

Νεκρός, dead; *ψιττακος*, a parrot.

Neneba DE VIS, Ibis, ser. 7, III, July, 1897, p. 384.

Type, *Neneba prasina* De Vis -----[*Meliphagidæ*.]

Named from the type locality (Neneba, Mt. Scratchley, Brit. New Guinea).

Neolesbia SALVIN, Catal. Birds Brit. Mus., XVI, 1892, p. 145.

Type, *Cyanolesbia uehrkorni* Berlepsch -----[*Trochilidæ*.]

Νέος, new; + *Lesbia* (*Λεσβία*, *Lesbian*).

Neophema SALVADORI, Catal. Birds Brit. Mus., XX, 1891, p. 569.

Type, *Psittacus pulchellus* Shaw -----[*Psittacidæ*.]

Νέος, new; *φήμη*, voice.

- Neotis** SHARPE, Bull. Brit. Orn. Club, I, June 1, 1893, p. 1.
Type, *Otis ludwigii* Rüppell [*Otididæ*.]
Néos, new; + *Otis* (*ὄτις*, a kind of bustard).
- Nesacanthis** SHARPE, Catal. Birds Brit. Mus., XIII, 1890, 483.
Type, *Foudia eminentissima* Bonaparte [*Ploceidæ*.]
Nḗσος, an island; + *Acanthis* (*ἀκανθίς*, a goldfinch).
- Neshyphantes** SHELLEY, Birds of Africa, I, 1896, p. 36.
Type, *Foudia flavicans* E. Newton [*Ploceidæ*.]
Nḗσος, island; + *Hyphantes* (*ὕφάντης*, a weaver).
- Nesierax** OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 203.
New name for *Harpe* Bonaparte, preoccupied [*Falconidæ*.]
Nḗσος island; *ιέραξ*, a hawk.
- Nesillas** OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 211.
New name for *Ellisia* Hartlaub, preoccupied [*Timaliidæ*.]
Nḗσος, island; *ιλλάς*, a thrush.
- Nesochen** SALVADORI, Catal. Birds Brit. Mus., XXVII, 1895, p. 126.
Type, *Anser sandvicensis* Vigors [*Anatidæ*.]
Nḗσος, island; *χῆν*, a goose.
- Nesocittes** HARGITT, Catal. Birds Brit. Mus., XVIII, 1890, p. 552.
Type, *Picumnus micromegas* Sundevall [*Picidæ*.]
Nḗσος, island; *κτίτης*, a colonist, inhabitant.
- Nescenas** SALVADORI, Catal. Birds Brit. Mus., XXI, 1893, p. 327.
Type, *Columba mayeri* Marchal [*Columbidæ*.]
Nḗσος, island; *οινάς*, a wild pigeon.
- Nesolimnas** ANDREWS, Novitates Zoologicae, III, Sept. 18, 1896, p. 266.
Type, *Rallus dieffenbachii* J. E. Gray [*Rallidæ*.]
Nḗσος, island; *λιμνάς* (*λιμναῖος*), marshy, of the mere.
- Nesomimus** RIDGWAY, Proc. U. S. Nat. Mus., XII, Feb. 5, 1890, p. 102.
Type, *Orpheus melanotis* Gould [*Mimidæ*.]
Nḗσος, island; + *Mimus* (*μῖμος*, an imitator).
- Nesotriccus** C. H. TOWNSEND, Bull. Mus. Comp. Zool., XXVII, July, 1895, p. 124.
Type, *Nesotriccus ridgwayi* C. H. Townsend [*Tyrannidæ*.]
Nḗσος, island; + *Triccus* (*τρίκκος*, a small bird).
- Nettalopex** HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 343.
New name for *Casarca* Bonaparte, on grounds of purism, [*Anatidæ*.]
Nḗττα, a duck; *ἀλώπηξ*, a fox.
- Notophoyx** SHARPE, Bull. Brit. Orn. Club, V, Dec. 30, 1895, p. xiii.
Type, *Ardea novæ-hollandiæ* Latham [*Ardeidæ*.]
Νότος, the south; *φάυξ*, a species of heron.

Nyctalatinus "KAUP, 1854," GRAY, Catal. Genera and Subgenera of Birds, 1855, p. 135.

Type, *Nyctalatinus albipunctatus* Kaup (= *Nyctale harrisi* Cassin) ----- [*Bubonidæ*.]

Nycticorax FORSTER, Synoptical Catalogue of British Birds, 1817, p. 59.

Type, *Nycticorax infustus* Forster (= *Ardea nycticorax*).
[*Ardeidæ*.]

Νύξ (νυκτ-), night; κόραξ, a raven.

Nyctimene HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 252.

New name for *Macabra* Bonaparte ----- [*Bubonidæ*.]

Νύξ (νυκτ-), night; μήνη, the moon.

Œcnas SALVADORI, Catal. Birds Brit. Mus., XXI, 1893, p. 248.

Type, *Columba nigrirostris* Sclater (first species mentioned)
(A subgenus of *Columba*) ----- [*Columbidæ*.]

Οἶνος, wine; οἰνός, a wild pigeon.

Œnolimnas SHARPE, Bull. Brit. Orn. Club, I, Jan. 26, 1893, p. xxviii.

Type, *Rallina isabellina* Schlegel ----- [*Rallidæ*.]

Οἶνος, wine; λιμνός (λιμναῖος), marshy, of the mere.

Œnopopelia BLANFORD, Fauna of Brit. India (Birds), IV, 1898, p. 47.

Type, *Columba tranquebarica* Hermann ----- [*Peristeridæ*.]

Οἰνωπός, wine-colored; πέλεια, a dove.

Onychornis GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. ix.

New name for *Megalonyx* "d'Orbigny" ----- [*Pteroptochidæ*.]

"Ονυξ (ὄνυχ-), a claw; ὄρνις, bird.

Ophrydornis BÜTTIKOFER, Notes Leyden Museum, XVII, Aug., 1895, p. 101.

Type, *Setaria albigularis* Blyth ----- [*Timaliidæ*.]

Ὠφρύς, eyebrow; ὄρνις, bird.

†**Opisthodactylus** AMEGHINO, Revista Argentina Hist. Nat., I, Dec., 1891, p. 453.

Type, *Opisthodactylus patagonicus* Ameghino ----- [*Stereornithes*.]

Ὀπισθοδάκτυλος, with fingers bent backward.

Oreoctistes SHARPE, Ibis, ser. 5, VI, Oct., 1888, p. 388.

Type, *Oreoctistes leucops* Sharpe ----- [*Timaliidæ*.]

Ὀρος (ὄρε-), mountain; κτίστης, a settler.

Oreospiza RIDGWAY, Manual N. A. Birds, ed. 2, Apr. 2, 1896, p. 605.

Type, *Fringilla chlorura* Audubon ----- [*Fringillidæ*.]

Ὀρος (ὄρε-), mountain; σπίζα, finch.

Oreospiza DE VIS, Ibis, ser. 7, III, July, 1897, p. 388.

Type, *Oreospiza fuliginosa* De Vis (see *Oreostruthus*).

[*Ploceidæ*.]

Ὀρος (ὄρε-), mountain; σπίζα, finch.

Oreostruthus DE VIS, Ibis, ser. 7, IV, Jan., 1898, p. 175.

New name for *Oreospiza* De Vis, preoccupied.....[*Ploceidæ*.]

"*Opos* (ὄρε-), mountain; *στρουθός*, sparrow.

Ornatipitta ELLIOT, Monogr. Pittidæ, ed. 2, Pt. 5, 1895, p. xviii (introd.).

Type, *Turdus guajanus* Müller.....[*Pittidæ*.]

(A subgenus of *Pitta*.)

Ornatus, decorated, adorned; + *Pitta*.

†**Ornithodesmus** SEELEY, Quart. Journ. Geol. Soc., XLIII, 1887, p. 206.

Type, *Ornithodesmus choniculus* Seeley.....[*Incertæ sedis*.]

"*Opvis* (ὀρνιθ-), a bird; *δεσμός*, a bond.

Oronertus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein.

Orn., 1890, p. 272.

New name for *Phalcobænus* Lafresnaye, on grounds of purism.

[*Falconidæ*.]

"*Opos*, mountain; *νέπρος*, a bird of prey.

†**Orthocnemus** MILNE-EDWARDS, Compte-Rendu Second Congrès Ornith. Int., II, 1892, p. 74.

Type, *Orthocnemus gallicus* Milne-Edwards (first species mentioned). (See *Idiornis*).....[*Incertæ sedis*.]

"*Orbós*, straight; *κνήμη*, leg.

Ortholophus GRANT, Catal. Birds Brit. Mus., XVII, 1892, p. 424.

Type, *Buceros albocristatus* Cassin (first species mentioned).

[*Bucerotidæ*.]

"*Orbós*, straight, upright; *λοφος*, crest.

Ortygonax HEINE, in Heine and Reichenow, Nomencl. Mus. Hein.

Orn., 1890, p. 321.

Type, *Rallus rytirhynchus* Vieillot (first species mentioned).

[*Rallidæ*.]

"*Ortyξ* (ὀρτυγ-), a quail; *ἄναξ*, king.

Ortygops HEINE, in Heine and Reichenow, Nomencl. Mus. Hein.

Orn., 1890, p. 320.

New name for *Coturnicops* Bonaparte, on grounds of purism.

[*Rallidæ*.]

"*Ortyξ* (ὀρτυγ-), a quail; + *ᾠψ*.

Oryzivora JERDON, Birds of India, II, 1863, p. 359.

Type, *Oryzivora leucotis* "Blyth," Jerdon.....[*Ploceidæ*.]

Oryza, rice; *vorare*, to devour.

†**Osteornis** GERVAIS, Bull. Soc. Philomath. de Paris, III, 1844, pp. 68-69.

Type, *Osteornis ardeaceus* Gervais (first species mentioned).

[*Incertæ sedis*.]

"*Οστέον*, bone; *ὄρνις*, bird.

Ostiarus GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. x.

New name for "*Psilopus* Oken, Gould".....[*Muscicapidæ*.]

Ostiarus, a doorkeeper.

Othyphantes SHELLEY, Birds of Africa, I, 1896, p. 37.

Type, *Sycobrotus reichenowi* Fischer[*Ploceidæ*.]

Ὀύς (ὤρ-), ear; + *Hyphantes* (ὕφάντης, a weaver).

†**Owenornis** MORENO and MERCERAT, Anales Mus. La Plata (Paleon. Argen., I), 1891, p. 64.

Type, *Owenornis affinis* Moreno and Mercerat (first species mentioned)[*Stereornithes*.]

Named for Richard Owen.

Oxyptelia SALVADORI, Catal. Birds Brit. Mus., XXI, 1893, p. 490.

Type, *Peristera cyanopis* Pelzeln[*Peristeridæ*.]

Ὀξύς, sharp, keen; πέλεια, a dove.

Pachycephalixus BÜTTIKOFER, Notes Leyden Museum, XVII, June 9, 1896, p. 241.

Type, *Muscicapa sinensis* Gmelin[*Pycnonotidæ*.]

Pachycephala (παχύς, thick; κεφαλή, head), + *Ixus* (ἰξός, a miser).

†**Pachyornis** LYDEKKER, Catal. Fossil Birds Brit. Mus., 1891, p. 316.

Type, *Dinornis elephantopus* Owen[*Dinornithidæ*.]

Παχύς, thick; ὄρνις, bird.

Pachyphantes SHELLEY, Birds of Africa, I, 1896, p. 36.

Type, *Hyphantornis superciliosus* Shelley[*Ploceidæ*.]

Παχύς, thick; + *Hyphantes* (ὕφάντης, a weaver).

†**Palæo-casuarius** FORBES, Trans. New Zealand Inst., XXIV, May, 1892, p. 189.

A *nomen nudum* here[*Dinornithidæ*.]

Παλαιός, ancient; + *Casuarius* (*kassuaris*, a native name).

†**Palæociconia** MORENO, Breve Reseña Prog. Mus. La Plata segundo semestre 1888, 1889, p. 30.

Type, *Palæociconia australis* Moreno[*Stereornithes*.]

Παλαιός, ancient; + *Ciconia* (*ciconia*, a stork).

†**Palæocolymbus** SEELEY, Proc. Cambridge Philos. Soc., I, 1864, p. 228 (*nomen nudum*).

Type, *Palæocolymbus barretti* Seeley (*nomen nudum*).

[*Enaliornithidæ*.]

Παλαιός, ancient; + *Colymbus* (κόλυμβος, a diver).

†**Palæocorax** FORBES, Bull. Brit. Orn. Club, I, Dec. 31, 1892, p. xxi.

Type, *Corvus moriorum* Forbes[*Corvidæ*.]

Παλαιός, ancient; κόραξ, a raven.

†**Palæocryptonyx** DEPÉRET, Comptes Rendus Acad. Sci., CXIV, Mar., 1892, p. 691.

Type, *Palæocryptonyx donniczani* Depéret[*Phasianidæ*.]

Παλαιός, ancient; + *Cryptonyx* (κρυπτός, hidden; ὄνυξ, claw).

†**Palæogrus** PORTIS, Mem. R. Acc. Sci. Torino, ser. 2, XXXVI, 1885, p. 362.

Type, *Palæogrus princeps* Portis[*Gruidæ*.]

Παλαιός, ancient; + *Grus* (*grus*, a crane).

- †**Palæolimnas** FORBES, *Ibis*, ser. 6, V, Oct., 1893, p. 544.
 Type, *Fulica newtoni* Milne-Edwards.-----[*Rallidæ*.]
Παλαιός, ancient; *λιμνᾶς* (*λιμναῖος*), marshy, of the mere.
- †**Palæopelargus** DE VIS, *Proc. Linn. Soc. N. S. Wales*, ser. 2, VI, May 23, 1892, p. 441.
 Type, *Palæopelargus nobilis* De Vis.-----[*Oiconiidae*.]
Παλαιός, ancient; *πελαργός*, a stork.
- †**Palæospheniscus** MORENO and MERCERAT, *Anales Mus. La Plata* (Paleon. Argen., I), 1891, p. 29.
 Type, *Palæospheniscus patagonicus* Moreno and Mercerat.¹
 [*Spheniscidae*.]
Παλαιός, ancient; + *Spheniscus* (*σφηνίσκος*, *σφήν*, a wedge).
- †**Palæotetrix** SHUFELDT, *Journ. Acad. Nat. Sci. Phila.*, XI, 1892, p. 415.
 Type, *Palæotetrix gilli* Shufeldt.-----[*Tetraonidae*.]
Παλαιός, ancient; *τέτριξ*, a grouse.
- †**Palaëtus** MILNE-EDWARDS, *Rech. Ois. Foss. France*, II, 1870, p. 571
 (a *nomen nudum* here).
 Type, *Palaëtus rapax* Milne-Edwards (a *nomen nudum* here).
 [*Falconidae*.]
Παλαιός, ancient; *ἀετός*, eagle.
- Pallasicarbo** COUES, *Osprey*, III, May (June 10), 1899, p. 144.
 Type, *Phalacrocorax perspicillatus* Pallas.-----[*Phalacrocoracidae*.]
 (A subgenus of *Phalacrocorax*.)
Pallas,² one of the giants; + *Carbo* (*carbo*, coal, charcoal).
- Palmeria** ROTHSCILD, *Ibis*, ser. 6, V, Jan., 1893, p. 113.
 Type, *Palmeria mirabilis* Rothschild (= *Himatione dolei* Wilson).
 [*Drepanidae*.]
 Named for Henry Palmer.
- Palumbis** FORSTER, *Synoptical Catalogue of British Birds*, 1817, p. 55.
 Type, *Columba palumbus* Linnæus.-----[*Columbidae*.]
Palumbus, a wood pigeon.
- Pan** RICHMOND, *Auk*, XVI, Jan., 1899, p. 77.
 New name for *Tetragonops* Jardine, preoccupied (see *Semnor-nis*) -----[*Capitonidae*.]
Πάν, *Pan*, a god of the forest.
- Paramythia** DE VIS, *Ann. Report Brit. New Guinea* (1890–91), 1892, App. CC, p. 95.
 Type, *Paramythia montium* De Vis.
 [*Sturnidae* (= *Paramythiidae*).]
Παραμυθία, encouragement, consolation.

¹ *P. antarcticus* Moreno and Mercerat is the first species mentioned, but Ameghino has selected this as the type of another genus (*Paraptenodytes*). *Palæospheniscus patagonicus*, which is second on the list, may perhaps stand as the type of the genus.

² Or for Peter Simon Pallas.

†**Paraptenodytes** AMEGHINO, *Revista Argentina Hist. Nat.*, I, 1891, p. 447.

Type, *Palæospheniscus antarcticus* Moreno and Mercerat.

[*Spheniscidæ*.]

Παρά, beside; + *Aptenodytes* (ἀπτήν, wingless; δύτες, diver).

Pardaliparus DE SELYS-LONGCHAMPS, *Bull. Soc. Zool. France*, IX, 1884, p. 73.

Type, *Parus elegans* Lesson (first species mentioned) -- [*Paridæ*.]

Pardalotus + *Parus*.

Parnopio HEINE, in Heine and Reichenow, *Nomencl. Mus. Hein. Orn.*, 1890, p. 314.

New name for *Hagedashia* Bonaparte, on grounds of purism.

[*Ibididæ*.]

Paryphephorus MEYER, *Ibis*, ser. 6, II, Oct., 1890, p. 420.

Type, *Craspedophora duivenbodei* Meyer ----- [*Paradiseidæ*.]

Παρυφή, a hem or border; φέρέω, I bear.

†**Patagornis** MORENO and MERCERAT, *Anales Mus. La Plata (Paleon. Argen., I)*, 1891, p. 55.

Type, *Patagornis marshi* Moreno and Mercerat (first species mentioned) ----- [*Stereornithes*.]

Patagonia; ὄρνις, bird.

Pecuarius TEMMINCK, *Manuel d'Ornithologie*, ed. 2, III, 1835, p. 76.

Substitute name for *Pastor* Temminck ----- [*Sturnidæ*.]

Pecuarius, relating to cattle, a grazier.

Pedilorhynchus REICHENOW, *Journ. für Orn.*, Jan., 1892, p. 34.

Type, *Pedilorhynchus stuhlmanni* Reichenow -- [*Muscicapidæ*.]

Πέδιλον, a sandal; ῥύγχος, bill.

†**Pelagornis** SEELEY, *Ann. Mag. Nat. Hist.*, ser. 3, XVIII, Aug., 1866, p. 110 (a *nomen nudum* here).

Type, *Pelagornis barretti* Seeley (a *nomen nudum* here).

[*Enaliornithidæ*.]

†**Pelargocrex** MILNE-EDWARDS, *Bull. Brit. Orn. Club*, I, July 4, 1893, p. liv.

New name for *Pelargopsis* Milne-Edwards, preoccupied (see *Pelargopappus*) ----- [*Ciconiidæ*.]

Πελαργός, a stork; + *Crex* (κρέξ, a crane).

†**Pelargodes** LYDEKKER, *Proc. Zool. Soc. Lond.*, Apr. 1, 1892, p. 477.

New name for *Pelargopsis* Milne-Edwards, preoccupied.

[*Ciconiidæ*.]

Πελαργός, a stork; εἶδος, form.

†**Pelargopappus** STEJNEGER, *Standard Nat. History*, IV (Birds), 1885, p. 163.

New name for *Pelargopsis* Milne-Edwards, preoccupied.

[*Ciconiidæ*.]

Πελαργός, a stork; πάππος, a grandfather.

†**Pelargopsis** MILNE-EDWARDS, Rech. Ois. Foss. France, I, 1867, p. 460.

Type, *Pelargopsis magna* Milne-Edwards (see *Pelargodes*; *Pelargocæ*; *Pelargopappus*) ----- [*Ciconiidae*.]

Πελαργός, a stork; *ὄψις*, look, appearance.

Pelasgia ISID. GEOFFROY ST.-HILAIRE, L'Écho du Monde Savant, III, 1837, p. 74.

Type, *Hirundo pelagica* Linnæus ----- [*Micropodidae*.]

Πελασγία, *Pelasgia*, an early name of Greece.

†**Pelecynornis** AMEGHINO, Revista Argentina Hist. Nat., I, 1891, p. 448.

New name for *Psilopterus* Moreno and Mercerat. [*Stereornithes*.]

Peltohyas SHARPE, Catal. Birds Brit. Mus., XXIV, 1896, p. 307.

Type, *Eudromias australis* Gould ----- [*Charadriidae*.]

Πέλτη, a shield; + *Hyas*.

Penthetriopsis SHARPE, Catal. Birds Brit. Mus., XIII, 1890, p. 220.

Type, *Loxia moineau* Müller (first species mentioned).

[*Ploceidae*.]

Penthetria (πενθήτρια, a mourner); + *ὄψις*, aspect.

Perissocephalus OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 209.

New name for *Gymnocephalus* Isid. Geoffroy St.-Hilaire, preoccupied (see *Calvifrons*) ----- [*Cotingidae*.]

Περισσός, wonderful; *κεφαλή*, head.

Perissornis¹ OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 216.

New name for *Dilophus* Vieillot, preoccupied ----- [*Sturnidae*.]

Περισσός, wonderful; *ὄρνις*, bird.

Perissospiza OBERHOLSER, Proc. U. S. Nat. Mus., XXII, Apr. 23, 1900, p. 227.

New name for *Pycnorhamphus* Hume, preoccupied.

[*Fringillidae*.]

Περισσός, wonderful; *σπίζα*, a finch.

Phacelias HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 67.

New name for *Kelaartia* Blyth, on grounds of purism.

[*Timaliidae*.]

Φάκελος, a bundle.

Phaëdrus GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. ix.

New name for *Ixos* Temminck ----- [*Pycnonotidae*.]

Φαιδρός, beaming, radiant.

Phaeospiza BOCAGE, Jorn. Sci. Math., Phys. e Nat. Lisboa, XII, no. xlvii, Jan., 1888, p. 148.

Type, *Phaeospiza thomensis* Bocage (= *Ligurnus rufobrunneus* Gray) ----- [*Fringillidae*.]

Φαίος, dusky; *σπίζα*, a finch.

¹ *Perissornis* will have to give way to *Creatophora* Lesson, 1847.

Phassa HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 281.

New name for *Ramphiculus* Bonaparte, on grounds of purism.
[*Treronidæ*.]

Φάσσα, the wood pigeon.

Philomela LINCK, Besch. Natur. Samml. Univers. Rostock, I, 1806, p. 3.

Substitute name for *Sylvia* Bechstein[*Turdidæ*.]

Phoenicurus FORSTER, Synoptical Catalogue of British Birds, 1817, p. 16.

Type, *Phoenicurus ruficilla* Forster (= *Motacilla phoenicurus* Linnæus)[*Turdidæ*.]

Pholia REICHENOW, Ornith. Monatsb., VIII, July, 1900, p. 99.

Type, *Pholia hirundinea* Reichenow[*Muscicapidæ*.]

Φωλία (φωλεία), life in a hole or cave.

† **Phorusrhacos**¹ AMEGHINO, Enum. List. Species Mam. Fósiles, Dec., 1887, p. 24.

Type, *Phorusrhacos longissimus* Ameghino[*Stereornithes*.]

Φορός, bearing; ῥάκος, a ragged garment.

Phyllopezus "SHARPE MS.," SHELLEY, Birds of Africa, I, 1896, p. 187.

Type, *Parra africana* Gmelin (see *Actophilus*)[*Jacanidæ*.]

Φύλλον, a leaf; πεζός, walking.

† **Physornis** AMEGHINO, Bol. Inst. Geogr. Argentino, XV, 1895, p. 576.

Type, *Physornis fortis* Ameghino[*Stereornithes*.]

Φῦσα, bellows; ὄρνις, bird.

Piculus ISID. GEOFFROY ST.-HILAIRE, Nouv. Ann. du Mus. d'Hist. Nat., ser. 3, I, 1832, p. 396.

Type, *Yunæ minuta* Vieillot[*Picidæ*.]

Piculus, dim. of *picus*, a woodpecker.

Piculus HODGSON, Journ. Asiat. Soc. Bengal, X, Pt. 1, 1841, p. 21.

New name for *Vivia* Hodgson, on grounds of purism. [*Picidæ*.]

Piculus, dim. of *picus*, a woodpecker.

Piculus BREHM, Isis, Sept., 1842, p. 650.

Type, *Picus minor* Linnæus[*Picidæ*.]

Piculus dim. of *picus*, a woodpecker.

Pionites HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 231.

New name for *Caica* Lesson, on grounds of purism.

[*Psittacidæ*.]

Πίων, plump, sleek; with suffix *ites*.

¹ This has been amended to *Phororhacos* Ameghino, Revista Argentina Hist. Nat., i, Aug., 1891, p. 256; also to *Phororhacis*, Slater, Ibis, Jan., 1893, p. 41 (note), where the derivation is assumed to be *φορέω*, and *ῥακίς*.

- Pisynolimnas** HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 317.
New name for *Erythra* Reichenbach, on grounds of purism. [Rallidæ.]
- Πίσυνος*, confiding in; λιμνάς, marshy, of the mere.
- Pithecophaga** GRANT, Bull. Brit. Orn. Club, VI, Dec. 30, 1896, p. xvi.
Type, *Pithecophaga jefferyi* Grant. [Falconidæ.]
- Πίθηκος*, a monkey; φαγεῖν (φάγος), to eat.
- Plagiospiza** RIDGWAY, Auk, XV, July (May 13), 1898, p. 224.
Type, *Aimophila superciliosa* Swainson. [Fringillidæ.]
- Πλάγιος*, oblique; σπίζα, a finch.
- Plectroperdix** HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 293.
New name for *Hepburnia* Bonaparte, on grounds of purism. [Phasianidæ.]
- Πληκτρον*, a cock's spur; + *Perdix* (πέρδιξ, a partridge).
- Plectrura** GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. x.
New name for *Oxyura* Bonaparte. [Anatidæ.]
- Πληκτρον*, a paddle; ούρά, tail.
- Poecilotreron** HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 281.
New name for *Sylphidæna* Bonaparte, on grounds of purism. [Treronidæ.]
- Ποικίλος*, spotted, mottled; τρήρων, a dove.
- Pogonites** HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 226.
New name for *Buccanodon* "Verreaux" Hartlaub, on grounds of purism. [Capitonidæ.]
- Πωγωνίτης*, bearded.
- Polemaëtus** HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 270.
Type, *Falco bellicosus* Daudin. [Falconidæ.]
- Πόλεμος*, war; αέτός, eagle.
- Poliolimnas** SHARPE, Bull. Brit. Orn. Club, I, Jan. 26, 1893, p. xxviii.
Type, *Porphyrrio cinereus* Vieillot. [Rallidæ.]
- Πολιός*, gray; λιμνάς (λιμναῖος), marshy.
- Polionetta** OATES, Manual Game Birds of India, Pt. 2, May 18, 1899, p. 149.
Type, *Anas pæcilorhyncha* Forster. [Anatidæ.]
- Πολιός*, gray; νήττα, a duck.
- Poliopsar** SHARPE, Ibis, ser. 5, VI, Oct., 1888, p. 476.
Type, *Sturnus sericeus* Gmelin (see *Spodiopsar*) [Sturnidæ.]
- Πολιός*, gray; ψάρ, starling.

Poospizopsis BERLEPSCH, Ibis, ser. 6, V, Apr., 1893, p. 208.

Type, *Poospiza cæsar* Sclater and Salvin [*Fringillidæ*.]

Poospiza (πόα, grass; σπιζα, finch); + ὄψις, aspect.

Porphyreicephalus REICHENOW, Vogelbild., Syst. Verz., 1883, p. 1.

Emendation of *Purpureicephalus* Bonaparte [*Psittacidæ*.]

Πορφύρα, purple; κεφαλή, head.

Porphyriornis ALLEN, Bull. Amer. Mus. Nat. Hist., IV, May 9, 1892, p. 57.

Type, *Porphyriornis comeri* Allen [*Rallidæ*.]

Πορφύρα, purple; ὄρνις, bird.

Porzanula FROHAWK, Ann. and Mag. Nat. Hist., ser. 6, IX, Mar., 1892, p. 247.

Type, *Porzanula palmeri* Frohawk [*Rallidæ*.]

Porzanula, dim. of *Porzana*.

Potamochelidon HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 355.

New name for *Seena* Blyth, on grounds of purism . . . [*Laridæ*.]

Ποταμός, river; χελιδών, a swallow.

Pratincola DEGLAND, Ornithologie Européenne, II, 1849, p. 106.

Type, *Hirundo pratincola* Linnæus (first species mentioned).

[*Cursoriidæ*.]

Pratum, a meadow; *incola*, inhabitant.

Premnoplex CHERRIE, Proc. U. S. Nat. Mus., XIV, Sept. 4, 1891, p. 339.

Type, *Margarornis brunnescens* Lawrence . . . [*Dendrocolaptidæ*.]

Πρέμνον, a stump, tree trunk; πλήσσω, to strike.

Prionornis "SCLATER MS.," SALVIN and GODMAN, Biol. Centr.-Amer., Aves, II, May, 1895, p. 454.

New name for *Prionirhynchus* Sclater, preoccupied.

[*Momotidæ*.]

Πρίων, a saw; ὄρνις, bird.

Prister HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 350.

Type, *Mergus brasiliensis* Vieillot [*Anatidæ*.]

Πριστήρ, a sawyer.

† **Prociconia** AMEGHINO, Revista Argentina Hist. Nat., I, 1891, p. 445.

Type, *Prociconia lydekkeri* Ameghino [*Ciconiidæ*.]

Pro, before; + *Ciconia* (*ciconia*, a stork).

† **Proherodius** LYDEKKER, Catal. Fossil Birds Brit. Mus., 1891, p. 60.

Type, *Proherodius oweni* Lydekker [*Ardeidæ*?]

Πρό, before; + *Herodius* (ἑρωδιός, heron).

† **Propelargus** LYDEKKER, Catal. Fossil Birds Brit. Mus., 1891, p. 65.

Type, *Propelargus cayluxensis* Lydekker [*Ciconiidæ*.]

Πρό, before; πελαργός, a stork.

† **Prophaethon** ANDREWS, Proc. Zool. Soc. Lond., Pt. 3, Oct. 1, 1899, p. 776.

Type, *Prophaethon shrubsolei* Andrews [*Phaëthontidæ*.]

Πρό, before; + *Phaethon*.

Prospoietus CABANIS, Journ. für Orn., Jan., 1892, p. 126.

Type, *Pachyrhamphus albinucha* Burmeister (see *Xenopsaris*).
[*Cotingidæ*.]

Προσποιητός, assumed, pretended, adopted.

† **Protibis**¹ AMEGHINO, Revista Argentina Hist. Nat., I, 1891, p. 445.

Type, *Protibis enemialis* Ameghino [*Plataleidæ*.]

Πρώτος, the first; + *Ibis* (ἰβίς, the ibis).

† **Protornis** H. VON MEYER, Neues Jahrb. für Mineralogie, 1844, p. 338.

Type, *Protornis glarniensis* von Meyer [*Incertæ sedis*.]

Πρώτος, the first; ὄρνις, bird.

Psaltia GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. x.

New name for *Salicaria* Selby [*Turdidæ*.]

Ψάλτριά, a female harper.

Pselliophorus RIDGWAY, Auk, XV, July (May 13), 1898, p. 225.

Type, *Tachyphonus tibialis* Lawrence [*Fringillidæ*.]

Ψέλλιον, armlet, bracelet; φορός, bearing.

Pseudalaemon PHILLIPS, Ibis, ser. 7, IV, July, 1898, p. 400.

Type, *Calendula fremantlii* Phillips [*Alaudidæ*.]

Ψευδής, false; + *Alæmon* (ἀλήμων, a wanderer, rover).

† **Pseudapteryx** LYDEKKER, Catal. Fossil Birds Brit. Mus., 1891, p. 218.

Type, *Pseudapteryx gracilis* Lydekker [*Apterygidæ*.]

Ψευδής, false; + *Apteryx* (ἄ, priv. + πτέρυξ, wing).

Pseudofringilla HUME, Stray Feathers, I, Feb., 1873, p. 314.

Type, *Indicator xanthonotus* Blyth [*Indicatoridæ*.]

Ψευδής, false; + *Fringilla* (*fringilla*, a sparrow).

Pseudogeranus SHARPE, Bull. Brit. Orn. Club, I, Mar. 28, 1893, p. xxxvii.

Type, *Grus leucauchen* Temminck [*Gruvidæ*.]

Ψευδής, false; γέρανος, a crane.

Pseudoglottis STEJNEGER, Zeitschr. Ges. Orn., I, Sept., 1884, p. 223 (note).

Type, *Totanus guttifer* Nordmann (= *Pseudototanus* Hume).

[*Scolopacidæ*.]

Ψευδής, false; + *Glottis* (*glottis*, a small bird).

† **Pseudolarus** AMEGHINO, Revista Argentina Hist. Nat., I, 1891, p. 446.

Type, *Pseudolarus eocænus* Ameghino (see *Ameghinia*).

[*Stereornithes*.]

Ψευδής, false; + *Larus* (λάρος, a gull).

¹*Protorhea* Moreno and Mercerat, 1891, described as a bird, has been shown by Ameghino (Revista Argentina Hist. Nat., I, 1891, p. 448) to be a mammal.

Pseudominla OATES, Ibis, ser. 6, VI, Oct., 1894, p. 480.

New name for *Sittiparus* Oates, preoccupied [*Timaliidae*.]

Ψευδής, false; + *Minla* (*minla*, a Nepalese name).

Pseudomyobius SALVADORI and FESTA, Boll. Mus. Zool. Anat. Comp.

Torino, XV, No. 362, Nov. 17, 1899, p. 12.

Type, *Pseudomyobius annectens* Salvadori and Festa.

[*Tyrannidae*.]

Ψευδής, false; + *Myiobius* (μυῖα, a fly; βαίνω [βει], I go after.

Pseudonestor ROTHSCILD, Bull. Brit. Orn. Club, I, Mar. 28, 1893,

p. xxxv.

Type, *Pseudonestor xanthophrys* Rothschild [*Drepanidae*.]

Ψευδής, false; + *Nestor* (Νέστωρ).

Pseudospingus BERLEPSCH and STOLZMANN, Proc. Zool. Soc. Lond.,

Aug. 1, 1896, p. 346.

Type, *Dacnis xanthophthalma* Taczanowski (first species mentioned) [*Tanagridae*.]

Ψευδής, false; σπιγγος (= σπινος), a small bird of the finch kind.

Pseudospiza SHARPE, in Rowley's Ornithological Miscellany, I, Pt. 3,

Jan., 1876, p. 207.

Emendation of *Pseudofringilla* Hume [*Indicatoridae*.]

Ψευδής, false; σπίζα, finch.

† **Pseudosterna** MERCERAT, Anales Soc. Cientifica Argentina, XLIII,

No. v, May, 1897, p. 237.

Type, *Pseudosterna degener* Mercerat (first species mentioned).

[*Laridae*.]

Ψευδής, false; + *Sterna*.

Pseudostruthus OUSTALET, Le Naturaliste, ser. 2, IV, Dec. 1, 1890,

p. 274.

Type, *Pseudostruthus gongonensis* Oustalet [*Fringillidae*.]

Ψευδής, false; στρουθός, sparrow.

Pseudotharrhaleus GRANT, Bull. Brit. Orn. Club, IV, June 29, 1895,

p. xl.

Type, *Pseudotharrhaleus caudatus* Grant [*Timaliidae*.]

Ψευδής, false; + *Tharrhaleus* (θαρράλεος, bold, daring).

Pseuduria SHARPE MS., COUES, Osprey, III, May (June 10), 1899, p. 144.

Type, "Black guillemots with 14 rectrices" (= *Cephus columba* Pallas, etc.) [*Alcidae*.]

Ψευδής, false; + *Uria*.

Psilomycter HARTERT, Ornith. Monatsb., VII, Oct., 1899, p. 160.

Type, *Trochilus theresiae* Da Silva [*Trochilidae*.]

Ψιλός, naked, bare; μυκτήρ, nose, snout.

† **Psilopterus** MORENO and MERCERAT, Anales Mus. La Plata (Paleon.

Argen., I), 1891, p. 67.

Type, *Psilopterus communis* Moreno and Mercerat (see *Pelecyornis*) [*Cathartidae* (= *Stereornithes*).]

Ψιλός, bare, naked; πτερόν, wing.

- Psilopus** "TEMME" BONAPARTE, *Consp. Gen. Avium*, I, 1850, p. 141.
 Type, *Bucco hayi* Gray [*Capitonidæ*.]
Ψιλος, naked; *πούς*, foot.
- Psiloscops** COUES, *Osprey*, III, May (June 10), 1899, p. 144.
 Type, *Scops flammeola* Kaup [*Bubonidæ*.]
 (A subgenus of *Megascops*).
Ψιλος, bare, smooth; *σκῶψ*, a small owl.
- Pteridophora** MEYER, *Bull. Brit. Orn. Club*, IV, Dec. 29, 1894, p. xi.
 Type, *Pteridophora alberti* Meyer [*Paradisidæ*.]
Πτερίς, fern; *φέρειν*, to bear.
- Pteronetta** SALVADORI, *Catal. Birds Brit. Mus.*, XXVII, 1895, p. 63.
 Type, *Querquedula hartlaubii* Cassin [*Anatidæ*.]
Πτερόν, wing; *νήπιτα*, a duck.
- Pterygocys** HEINE, in Heine and Reichenow, *Nomencl. Mus. Hein. Orn.*, 1890, p. 288.
 New name for *Pterochlorus* Bonaparte [*Pteroclidæ*.]
Πτέρυξ, wing; *ὤκύς*, swift, fleet.
- Ptilocorys** MADARASZ, *Magyar. Madaras Fuz.*, II, 1899, p. 48.
 New name for *Galerida* (emend. *Galerita*) Boie, 1828, not *Galerita* Fabricius, 1801 [*Alaudidæ*.]
Πτίλον, a feather; *κόρυς*, a lark.
- Ptilœmus** GRANT, *Catal. Birds Brit. Mus.*, XVII, 1892, p. 392.
 Type, *Buceros tickelli* Blyth (first species mentioned).
 [*Bucerotidæ*.]
Πτίλον, feather; *λαιμός*, throat.
- Ptiloprora** DE VIS, *Ann. Report Brit. New Guinea (1893-94)*, 1894, App. EE, p. 103.
 Type, *Ptilotis? guisei* De Vis (first species mentioned).
 [*Meliphagidæ*.]
Πτίλον, feather; *πρῶρα*, prow.
- Ptiloxena** CHAPMAN, *Bull. Amer. Mus. Nat. Hist.*, IV, 1892, p. 307.
 Type, *Quiscalus atrovioleaceus* d'Orbigny [*Icteridæ*.]
Πτίλον, feather; *ξένος*, strange.
- Ptoceas** HEINE, in Heine and Reichenow, *Nomencl. Mus. Hein. Orn.*, 1890, p. 342.
 New name for *Rufibrenta* Bonaparte, on grounds of purism.
 [*Anatidæ*.]
Πτωκάς, shy, timorous.
- Ptynx** BLYTH, in Cuvier's *Animal Kingdom*, 1840, p. 175 (note).
 Type, *Strix uralensis* Pallas [*Bubonidæ*.]
Πτύγξ, a water bird.
- Pulehripitta** ELLIOT, *Monogr. Pittidæ*, ed. 2, Pt. 5, 1895, p. xviii (introd.).
 Type, *Pitta iris* Gould [*Pittidæ*.]
 (A subgenus of *Pitta*).
Pulcher, beautiful; + *Pitta*.

Rectirostrum REICHENOW, Ornith. Monatsb., I, Feb., 1893, p. 32.

Type, *Rectirostrum hypochondriacum* Reichenow. [Timaliidae.]
Rectus, straight; *rostrum*, beak.

†**Remiornis** LEMOINE, Rech. Ois. Foss. Environs de Reims, Pt. 2, 1881, p. 158.

Type, *Remiornis heberti* Lemoine. [Gastornithidae.]
Remus, an oar; ῥομῖς, bird.

Remiza STEJNEGER, Proc. U. S. Nat. Mus., IX, Feb. 10, 1887, p. 387.

New name for *Aegithalus* Boie, preoccupied. [Paridae.]
Remiz, the Polish vernacular name of *Parus pendulinus* Linnæus.

Rhabdochlamys OUSTALET, Bull. Mus. d'Hist. Nat., III, 1897, p. 208.

Type, *Rhabdochlamys dejeani* Oustalet. [Timaliidae.]
 ῥάβδος, a rod; χλαμύς, a mantle.

Rhabdotorrhinus MEYER and WIGLESWORTH, Abhandl. und Berichte Mus. Dresden, V, no. 8, 1895, p. 6.

Type, *Buceros exaratus* Temminck. [Bucerotidae.]
 ῥάδωτός, striped, streaked; ῥίς, nose.

Rhagoborus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 229.

New name for *Baillonius* Cassin, on grounds of purism.

[Rampastidae.]

ῥάξ (ῥαγο-), a grape; βορός, devouring.

Rhagorhina GLOGER, Hand und Hilfsbuch, I, 1842, p. 360.

Type, *Columba auricularis* Temminck (an artifact).

[Incertæ sedis.]

ῥάξ (ῥαγο-), a grape; ῥίς, nose.

Rhamphotreron HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 279.

New name for *Toria* Hodgson, on grounds of purism.

[Treronidae.]

ῥάμφος, beak; + *Treron* (τήρων, a dove).

Rhaphidornis REICHENOW, Ornith. Monatsb., V, Aug., 1897, p. 123.

Type, *Rhaphidornis flavifrons* Reichenow. [Nectariniidae.]

ῥαφίς (ῥαφιδ-), a needle; ῥομῖς, bird.

Rhimphalea HEINE and REICHENOW, Nomencl. Mus. Hein. Orn., 1890, p. 338.

New name for *Stiltia* Bonaparte, on grounds of purism.

[Cursoriidae.]

ῥιμφαλέος, light, swift.

Rhinornis GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. x.

New name for *Rhinomya* Geoffroy St.-Hilaire. [Pteroptochidae.]

ῥίς (ῥιν-), nose; ῥομῖς, bird.

Rhodacanthis ROTHSCHILD, Ann. and Mag. Nat. Hist., ser. 6, X, July, 1892, p. 110.

Type, *Rhodacanthis palmeri* Rothschild[*Drepanidæ*.]
'Ρόδον, rose; + *Acanthis* (ἀκανθίς, a goldfinch).

Rhodornis SHELLEY, Birds of Africa, I, 1896, p. 67.

Type *Pholidornis rubrifrons* Sharpe and Ussher[*Dicæidæ*.]
'Ρόδον, rose; ὄρνις, bird.

Rhodothraupis RIDGWAY, Auk, XV, July (May 13), 1898, p. 226.

Type, *Fringilla celæno* Lichtenstein[*Fringillidæ*.]
'Ρόδον, rose; θραυπίς, a little bird, like the goldfinch.

Rhombura GLOGER, Hand- und Hilfsbuch, I, 1842, p. 360.

Type, *Columba ocyura* Temminck[*Treronidæ*.]
'Ρόμβος, rhomb; οὐρά, tail.

Rhopocichla OATES, Fauna of Brit. India (Birds), I, Dec., 1889, p. 159.

Type, *Brachypteryx atriceps* Jerdon[*Timaliidæ*.]
Ρώψ (ῥωπός), underwood, brushwood; κίχλη, a thrush.

Rhopocichla ALLEN, Bull. Amer. Mus. Nat. Hist., III, Feb. 20, 1891, p. 199.

Type, *Myiothera ardesiaca* Wied[*Formicariidæ*.]
'Ρώψ (ῥωπός), underwood, brushwood; κίχλη, a thrush.

Rhynchortyx GRANT, Catal. Birds Brit. Mus., XXII, 1893, p. 443.

Type, *Odontophorus spodiostethus* Salvin (first species mentioned)[*Phasianidæ*.]
'Ρύγχος, beak; + *Ortyx* (ὄρτυξ, a quail).

Rhynchosimus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 326.

New name for *Terekia* Bonaparte, on grounds of purism.
[*Scolopacidæ*.]

'Ρύγχος, beak; σιμός, uphill, concave.

Rhynchospiza RIDGWAY, Auk, XV, July (May 13), 1898, p. 224.

Type, *Hæmophila stolzmanni* Taczanowski[*Fringillidæ*.]
'Ρύγχος, beak; σπιζα, a finch.

Riparia FORSTER, Synoptical Catalogue of British Birds, 1817, p. 17.

Type, *Riparia europæa* Forster (= *Hirundo riparia* Linnæus).
[*Hirundinidæ*.]

Riparius, frequenting river banks.

† **Rostrornis** MORENO and MERCERAT, Anales Mus. La Plata (Paleon. Argén., I), 1891, p. 40.

Type, *Rostrornis floweri* Moreno and Mercerat ..[*Stereornithes*.]
Rostrum, beak; ὄρνις, bird.

Rothschildia PERKINS, in Wilson and Evans, Aves Hawaiienses, June, 1899, p. xxi.

Type, *Himatione parva* Stejneger[*Drepanidæ*.]
Named for Mr. Walter Rothschild.

Rubricapilla BREHM (see Blyth, Journ. Asiat. Soc. Bengal, XIII, Pt. 2, 1844, p. 954).

Type, the "Redpole linnets" [*Fringillidæ*.]

Rubra, red; *capillus*, hair.

Rupicola BOGDANOW "1881," Conspectus Av. Imp. Ross., Pt. 1, 1884, p. 1.

Type, *Columba livia* Bonnaterre (first species mentioned).

[*Columbidæ*.]

Rupes, a rock; *incola*, an inhabitant.

Salvadorina ROTHSCHILD and HARTERT, Novitates Zoologicae, I, Sept., 1894, p. 683.

Type, *Salvadorina waigiuiensis* Rothschild and Hartert.

[*Anatidæ*.]

Named for Count Tomaso Salvadori.

Sapheopipo HARGITT, Catal. Birds Brit. Mus., XVIII, 1890, p. 378.

Type, *Picus noguchii* Seebohm [*Picidæ*.]

Σαφέως, clearly, plainly; *πιπώ*, a kind of woodpecker,

Sarcogeranus SHARPE, Bull. Brit. Orn. Club, I, Mar. 28, 1893, p. xxxvii.

Type, *Grus leucogeranus* Pallas [*Gruidæ*.]

Σάρξ (*σάρκ*-), flesh; *γέρανος*, a crane.

Sarcogyps LESSON, L'Écho du Monde Savant, ser. 2, VI, Dec. 8, 1842, col. 1038.

Type, *Vultur pondicerianus* Latham [*Vulturidæ*.]

(A subgenus of *Vultur*).

Σάρξ (*σάρκ*-), flesh; *γύψ*, a vulture.

Sarganura DE VIS, Ann. Report Brit. New Guinea (1896-97), 1898, Appendix AA, p. 87.

Type, *Sarganura maculiceps* De Vis [*Meliphagidæ*.]

Σαργάνη, a plait, band; *οὐρά*, tail.

Sarothrura HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 319.

New name for *Corethrura* Reichenbach, preoccupied. [*Rallidæ*.]

Σάρωθρον, a sweeping broom; *οὐρά*, tail.

Scæorhynchus OATES, Fauna of Brit. India (Birds), I, Dec., 1889, p. 68.

Type, *Paradoxornis ruficeps* Blyth [*Paridæ*.]

Σκαίος, awkward, clumsy; *ρύγχος*, beak.

Scaniornis DAMES, Bihang K. Vet.-Akad. Handl., XVI, Pt. 4, no. 1, 1890, p. 4, pl.

Type, *Scaniornis lundgreni* Dames [*Incertæ sedis*.]

Σκανά (*σκηνή*), a tent; *ὄρνις*, bird.

Scenopæetes COUES, Auk, VIII, Jan., 1891, p. 115.

New name for *Scenopæus* Ramsay, preoccupied.

[*Ptilonorhynchidæ*.]

Σκῆνος, a tent, house; *ποιητής*, maker.

Schoeniclus FORSTER, Synoptical Catalogue of British Birds, 1817, p. 51.

Type, *Emberiza schæniclus* Linnæus [*Fringillidæ*.]

Sclateria OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 209.

New name for *Heterocnemis* Scater, preoccupied.

[*Formicariidæ*.]

Named for Dr. P. L. Slater.

Scototheres HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 249.

New name for *Lempijius* Bonaparte, on grounds of purism.

[*Rubonidæ*.]

Σκόρος, darkness; θηράω, I hunt.

Scotothorus OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 208.

New name for *Heteropelma* Bonaparte, preoccupied [Pipridæ.]

Σκόρος, darkness; θοπεῖν, to leap.

Scyrornis GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. x.

New name for *Sialia* Swainson[*Turdidæ*.]

Σκῦρός, gypsum, stucco; ὄρνις, bird.

Semnornis RICHMOND, Auk, XVII, Apr., 1900, p. 179.

New name for *Pan* Richmond (vice *Tetraganops* Jardine), preoccupied[*Capitonidæ*.]

Σεμνός, solemn; ὄρνις, bird.

Serinopsis RIDGWAY, Auk, XV, July (May 13), 1898, p. 225.

Type, *Fringilla arvensis* Kittlitz[*Fringillidæ*.]

Serinus (a serin-finch). + ὄψις, appearance.

Serrator SPRÜNGLI, in Storr, Alpenreise, I, 1784, p. 74.

Type, *Mergus merganser* Linnæus[*Anatidæ*.]

Setogyps LESSON, L'Écho du Monde Savant, ser. 2, VI, Dec. 8, 1842, col. 1038.

Type, *Vultur imperialis* Temminck (first name cited) [Vulturidæ.]

(A subgenus of *Vultur*).

Seta, a bristle, + *Gyps* (γύψ, a vulture).

Sirycter HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 309.

Type, *Ardea cyanocephala* Molina[*Ardeidæ*.]

Συρικτήρ, the male crane.

Sittiparus OATES, Fauna of Brit. India (Birds), I, Dec., 1889, p. 171.

Type, *Minla cinerea* Blyth (see *Pseudominla*)[*Timaliidæ*.]

Sitta (σίττη, a kind of woodpecker), + *Parus* (*parus*, a titmouse).

Spathopterus NORTH, Ibis, ser. 7, I, July, 1895, p. 339.

Type, *Polyteles alexandrea* Gould[*Psittacidæ*.]

Σπάθη, a blade; πτερόν, wing.

Spermophilopsis ROTHSCILD, Bull. Brit. Orn. Club, IV, May 31, 1895, p. xxxvii.

New name for *Drepanorhynchus* Dubois, preoccupied.

[*Fringillidæ*.]

Spermophila (σπέρμα, seed; φιλεῖν, to love); + ὄψις, aspect
Spiloptera "BLYTH," JERDON, Birds of India, I, 1862, p. 492.

Type, *Troglodytes punctatus* Blyth.....[*Troglodytidæ*.]

(See *Elachura*.)

Spilospiza SALVADORI, Ann. Mus. Civ. Stor. Nat. Genova, ser. 1, VII, 1875, p. 643.

New name for *Erythrospiza* Kaup, preoccupied...[*Falconidæ*.]

Σπίλος, a spot; σπιζιάς, a sparrow-hawk.

Spodiopsar SHARPE, Ibis, ser. 6, I, Oct., 1889, p. 580.

New name for *Poliopsar* Sharpe, preoccupied.....[*Sturnidæ*.]

Σπόδιος, ash-colored; ψάρ, a starling.

Sporathraupis RIDGWAY, Auk, XV, Oct., 1898, p. 331.

New name for *Hemithraupis* Ridgway, preoccupied.

[*Tanagridæ*.]

Σπορά, seed; θραυπίς, a small bird, like the goldfinch.

†**Staphylornis** MERCERAT, Anales Soc. Cientifica Argentina, XLIII, No. V, May, 1897, p. 233.

Type, *Staphylornis gallardoi* Mercerat (first species mentioned).

[*Stereornithes*.]

Σταφυλή, a bunch of grapes; ὄρνις, bird.

Stasiasticus HARTERT, Novitates Zoologicae, III, Dec. 29, 1896, p. 539.

Type, *Stasiasticus montis* Hartert.....[*Timaliidæ*.]

Στασιαστικός, seditious.

Stelgidillas OBERHOLSER, Proc. U. S. Nat. Mus., XXII, Oct. 9, 1899, p. 30.

Type, *Andropadus gracilirostris* Strickland....[*Pycnonotidæ*.]

Στελγίς (στελγιδ-), a scrapper; ἰλλάς, a thrush.

Stelgidostomus RIDGWAY, Auk, XV, July (May 13), 1898, p. 226.

Type, *Saltator marillosus* Cabanis.....[*Fringillidæ*?]

Στελγίς (στελγιδ-), a scrapper; στόμα, mouth.

†**Stephanornis** MERCERAT, Note sur la Géologie de la Patagonie, 1893, p. 5.

Type.....[*Stereornithes*.]

Στέφανος, crown; ὄρνις, bird.

Stephanoxis SIMON, Catal. Famille des Trochilides, 1897, p. 40.

New name for *Cephallepis* Loddiges, preoccupied.[*Trochilidæ*.]

Στέφανος, crown; ὀξύς, sharp, pointed.

†**Stereornis** MORENO and MERCERAT, Anales Mus. La Plata (Paleon. Argen., I), 1891, p. 45.

Type, *Stereornis rolhieri* Moreno and Mercerat (first species mentioned).....[*Stereornithes*.]

Στερεός, solid, fixed; ὄρνις, bird.

Stictognathus BÜTTIKOFER, Notes Leyden Museum, XVII, June 9, 1896, p. 242.

Type, *Pycnonotus taiwanus* Styan [*Pycnonotidæ*.]

Στικτός, marked, spotted; γνάθος, jaw.

Stictolimnas BÜTTIKOFER, Notes Leyden Museum, XV, Oct., 1893, p. 274.

Type, *Stictolimnas sharpei* Büttikofer [*Rallidæ*.]

Στικτός, spotted; λιμνάς (λιμναῖος), marshy, of the mere.

Stictospiza SHARPE, Catal. Birds Brit. Mus., XIII, 1890, p. 287.

Type, *Fringilla formosa* Latham [*Ploceidæ*.]

Στικτός, spotted; σπιζα, a finch.

Stilbopsar REICHENOW, Ornith. Monatsb., I, Feb., 1893, p. 31.

Type, *Stilbopsar stuhlmanni* Reichenow [*Sturnidæ*.]

Στίλβω, I shine, glitter; ψάρ, starling.

Stizoptera OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 215.

New name for *Stictoptera* Reichenbach, preoccupied. [*Ploceidæ*.]

Στίζω, I mark; πτερόν, wing.

Stizorhina OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 213.

New name for *Cassinia* Hartlaub, preoccupied. [*Muscicapidæ*.]

Στίζω, I mark; ρίς, nose.

Styptes GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. xi.

New name for *Tigrisoma* Swainson [*Ardeidæ*.]

Στιπτός, trodden down.

Sylvicola BOGDANOW "1881," Consp. Av. Imp. Ross., Pt. 1, 1884, p. 3.

Type, *Columba fusca* Pallas (first species mentioned).

[*Columbidæ*.]

Sylva, a wood, forest; *incola*, an inhabitant.

†**Tachyornis** MILNE-EDWARDS, Compte-Rendu Second Congrès Orn. Int., Pt. 2, 1892, p. 66.

Type, *Tachyornis hirundo* Milne-Edwards (see *Belornis*).

[*Incertæ sedis*.]

Ταχύς, swift; ὄρνις, bird.

Tantalops COUES, Key to North American Birds, ed. 2, 1884, p. 653.

Type, *Tantalus loculator* Linnæus [*Ciconiidæ*.]

Tantalus (Τάνταλος, a king of Phrygia); + ὤψ.

†**Taoperdix** MILNE-EDWARDS, Rech. Ois. Foss. de France, II, 1870, p. 225.

Type, *Tetrao? pessieti* Gervais [*Phasianidæ*.]

Ταῶς, a peacock; πέρδιξ, partridge.

†**Taphætus** DE VIS, Proc. Linn. Soc. N. S. Wales, ser. 2, VI, Sept. 9, 1891, p. 123.

Type, *Uroæetus brachialis* De Vis [*Falconidæ*.]

Τάφος, grave; ἀετός, eagle.

†**Tapinopus** MILNE-EDWARDS, Comptes-Rendu Second Congrès Orn. Int., Pt. 2, 1892, p. 79.

Type, *Tapinopus ellioti* Milne-Edwards (see *Diatropornis*).

[*Incertæ sedis*.]

Ταπεινός, low; ποῦς, foot.

Tectonornis SHARPE, Monogr. Paradiseidæ, Pt. 1, 1891.

New name for *Scenopæus* Ramsay, preoccupied (see *Scenopæetes*) -----[*Ptilonorhynchidæ*.]

Τέκτων, a builder; ὄρνις, bird.

Telespyza WILSON, Ibis, ser. 6, II, July, 1890, p. 341.

Type, *Telespyza cantans* Wilson -----[*Drepanidæ*.]

Τῆλε, far away; σπίζα, a finch.

Temnurus SWAINSON, "Classification of Birds," II, July, 1837, p. 337.

Type, *Temnurus albicollis* Swainson (= *Trogon temnurus* Temminck) -----[*Trogonidæ*.]

(A subgenus of *Trogon*.)

Τέμνω, I cut; οὐρά, tail.

Terenottreron HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 280.

New name for *Thouarsitreron* Bonaparte, on grounds of purism.

[*Treronidæ*.]

Τέρενος, soft, delicate; + *Treron* (τρήρων, a dove).

Thamnocharis SCLATER, Catal. Birds Brit. Mus., XV, 1890, p. 310.

Type, *Grallaria dignissima* Sclater and Salvin -----[*Formicariidæ*.]

Θάμνος, a bush; χάρις, grace.

†**Thegornis** AMEGHINO, Bol. Inst. Geogr. Argentino, XV, 1895, p. 598.

Type, *Thegornis musculosus* Ameghino (first species mentioned).

[*Falconidæ*.]

Θήγω, to sharpen; ὄρνις, bird.

Thereiceryx BLANFORD, Ibis, ser. 6, V, Apr., 1893, p. 237.

Type, *Bucco zeylonicus* Gmelin -----[*Capitonidæ*.]

Θέρος, summer; κήρυξ, herald.

Thringorhina OATES, Fauna of Brit. India (Birds), I, Dec., 1889, p. 155.

Type, *Turdinus guttatus* Tickell -----[*Timaliidæ*.]

Θριγγός, cornice, eaves; ρίς, nose.

Thryolegus OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 210.

New name for *Limnophyes* Sclater, preoccupied -----[*Furnariidæ*.]

Θρύον, a rush; λέγω, I lie down.

Tigriornis SHARPE, Bull. Brit. Orn. Club, V, Dec. 30, 1895, p. xiv.

Type, *Tigrisoma leucolophum* Jardine -----[*Ardeidæ*.]

Τίγρις, tiger; ὄρνις, bird.

Timeta GISTEL, Naturgesch. des Thierreichs für höhere Schulen, 1848, p. ix.

New name for *Leptorhynchus* Du Bus -----[*Recurvirostridæ*.]

Τιμητής, an appraiser.

†**Titanornis** MERCERAT, Note sur la Géologie de la Patagonie, 1893, p. 5.

Type, *Titanornis mirabilis* Mercerat[*Stereornithes*.]

Τιτάν, Titan; ὄρνις, bird.

Tolmerus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 260.

New name for *Chiquera* Bonaparte, on grounds of purism.

[*Falconidæ*.]

Τολμηρός, bold.

†**Tolmodus**¹ AMEGHINO, Revista Argent. Hist. Nat., I, Aug., 1891, p. 157.

Type, *Tolmodus inflatus* Ameghino[*Stereornithes*.]

Τόλμα, daring, boldness; ὄδους, tooth.

Tolmolestes HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 270.

New name for *Spizastur* Lesson, on grounds of purism.

[*Falconidæ*.]

Τόλμα, daring; ληστής, robber.

Trachylaemus REICHENOW, Journ. für Orn., 1891, p. 394.

Type, *Capito goffini* Schlegel[*Capitonidæ*.]

Τραχύς, rough; λαιμός, throat.

Traversia ROTHSCILD, Bull. Brit. Orn. Club, IV, Dec. 29, 1894, p. x.

Type, *Traversia lyalli* Rothschild[*Xenicidæ*.]

Named for Henry H. Travers.

Trichocichla REICHENOW, Journ. für Orn., "Oct.," 1890, p. 489.

Type, *Trichocichla rufa* Reichenow[*Timaliidæ*.]

Θρίξ (τριχ-), hair; κύκλην, thrush.

Tricholimnas SHARPE, Bull. Brit. Orn. Club, I, Jan. 26, 1893, p. xxviii.

Type, *Gallirallus lafresnayanus* Verreaux[*Rallidæ*.]

Θρίξ (τριχ-), hair; λιμνάς (λιμναῖος), marshy, of the mere.

Trichoparadisea MEYER, Abhandl. und Berichte Mus. Dresden, IV, No. 3, 1893, p. 20.

Type, *Paradisea guilielmi* Cabanis[*Paradiseidæ*.]

Θρίξ (τριχ-), hair; + *Paradisea*.

Trigonoceps LESSON, L'Écho du Monde Savant, ser. 2, VI, Dec. 8, 1842, col. 1038.

Type, *Vultur occipitalis* Burchell[*Vulturidæ*.]

(A subgenus of *Vultur*).

Τρίγωνος, three-cornered; + *Caput (ceps)*, head.

Trochilus FORSTER, Synoptical Catalogue of British Birds, 1817, p. 14.

Type, *Trochilus minor* Forster (= *Sylvia rufa* Bechstein).

[*Turdidæ*.]

Trygon BREHM, Handb. Vög. Deutschl., 1831, p. 495.

Type, *Columba migratoria* Linnæus[*Columbidæ*.]

Τρυγών, the turtle dove.

¹ Here described as a mammal.

Tryzusa HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 276.

New name for *Turturana* Bonaparte, on grounds of purism.

[*Columbidae*.]

Τρύζω, I coo like a dove.

Tusalia HODGSON (see Hodgson, Journ. Asiat. Soc. Bengal, XII, Pt. 2, 1843, p. 937).

Same as *Coccyzura* Hodgson ----- [*Columbidae*.]

Tusalia, a Nepalese name.

†**Tylopteryx** HUTTON, Trans. New Zealand Institute, XXIV, May, 1892, p. 116.

Type, *Dinornis gracilis* Owen (first species mentioned).

[*Dinornithidae*.]

(A subgenus of *Dinornis*.)

Τύλος, a swelling (in allusion to the top of the skull); + *Apteryx* (*ἄ*, priv. + *πτέρυξ*, wing).

Typanus NITZSCH, Observ. Avium Arteria Carotide Communi, 1829, p. 18.

Type *Charadrius aegyptius* Linnaeus ----- [*Charadriidae*.]

Τύπανος, a kind of bird.

Tyto HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 252.

New name for *Myrtha* Bonaparte, on grounds of purism.

[*Bubonidae*.]

Τυτώ, the night owl.

Ulocomus HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 229.

New name for *Beauharnesius* Bonaparte, on grounds of purism.

[*Ramphastidae*.]

Ούλος, curly; *κόμη*, hair.

Uratelornis ROTHSCILD, Novitates Zoologicae, II, Dec. 30, 1895, p. 479.

Type, *Uratelornis chimacra* Rothschild ----- [*Coraciidae*.]

Ούρά, tail; *τέλος*, complete, perfect; *ὄρνις*, bird.

Urococcyx SHELLEY, Catal. Birds Brit. Mus., XIX, 1891, p. 398.

Type, *Phenicophæus erythrognathus* Hartlaub ----- [*Cuculidae*.]

Ούρά, tail; *κόκκυξ*, a cuckoo.

Urorepanis SHELLEY, Monograph Nectariniidae, Pt. 1, July, 1876, p. 79.

Type, *Æthopyga christinae* Swinhoe ----- [*Nectariniidae*.]

Ούρά, tail; + *Drepanis* (*δρεπάνη*, a sickle).

Urophlexis STEJNEGER, Proc. U. S. Nat. Mus., XV, Aug. 2, 1892, p. 341.

New name for *Urosphena* Swinhoe, preoccupied ---- [*Turdidae*.]

Ούρά, tail; *φλεξίς*, name of an unknown bird.

Vestipedes LESSON, L'Écho du Monde Savant, ser. 2, VIII, Oct. 22, 1843, col. 756.

Type¹ -----[*Trochilidæ*.]

Vestis, a covering; *pes*, the foot.

Viridonia ROTHSCHILD, Ann. and Mag. Nat. Hist., ser. 6, X, July, 1892, p. 112.

Type, *Viridonia sagittirostris* Rothschild -----[*Drepanidæ*.]

Warszewiczia BOUCARD, Genera of Humming Birds (in Humming Bird, V, Pt. 1), Mar., 1895, p. 224.

Type, *Helianthus viola* Gould -----[*Trochilidæ*.]

Named for Josef Warszewicz.

Xanthixus OATES, Fauna Brit. India (Birds), I, Dec., 1889, p. 274.

Type, *Pycnonotus flavescens* Blyth -----[*Pycnonotidæ*.]

Ξανθός, yellow; + *Ixus*.

Xanthochlamys SHARPE, Bull. Brit. Orn. Club, IV, Dec. 29, 1894, p. xv.

Type, *Amblyornis subalaris* Sharpe -----[*Ptilonorhynchidæ*.]

Ξανθός, yellow; χλαμύς, cloak, mantle.

Xanthoenus SHARPE, Bull. Brit. Orn. Club, III, Apr. 30, 1894, p. xxxvii.

Type, *Ardea flavicollis* Latham (first species mentioned).

[*Ardeidæ*.]

Ξανθός, yellow; ὄκνος, bittern.

Xenopsaris RIDGWAY, Proc. U. S. Nat. Mus., XIV, Oct. 22, 1891, p. 479.

Type, *Pachyrhamphus albinucha* Burmeister -----[*Cotingidæ*.]

Ξένος, strange; ψάρ, a starling.

Zalias HEINE, in Heine and Reichenow, Nomencl. Mus. Hein. Orn., 1890, p. 362.

New name for "*Thiellus* (!) Rehb. 1853, nec Glog. 1827."

[*Puffinidæ*.]

Ζάλη, surf, spray.

Zapterus OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 201.

New name for *Euhyas* Sharpe, preoccupied ----[*Charadriidæ*.]

Ζα, intensive particle; πτερόν, wing.

Zarhynchus OBERHOLSER, Proc. Acad. Nat. Sci. Phila., June 2, 1899, p. 215.

New name for *Eucorystes* Selater, preoccupied -----[*Icteridæ*.]

Ζα, intensive particle; ῥύγχος, bill.

Zeledonia RIDGWAY, Proc. U. S. Nat. Mus., XI, Sept. 20, 1889, p. 537.

Type, *Zeledonia coronata* Ridgway -----[*Turdidæ*.]

Named for Señor José C. Zeledon.

¹ Proposed as a subgenus or "race" of *Ornismya*, with the following species: *O. vestita* Lesson; *O. pennata* (new here); *O. maniculata* Lesson (new name, = "*O. vestita femina*, Long., Rev. Zool., 1838, p. 314"); *O. glomata* Lesson (new here). *Vestipedes* is equivalent to, and earlier than, *Eriocnemis*.

Zonifer SHARPE, Catal. Birds Brit. Mus., XXIV, 1896, p. 154.

Type, *Charadrius tricolor* Vieillot.....[*Charadriidæ*.]

Ζώνη, a girdle, belt; φέρω, I bear.

Zonophaps SALVADORI, Catal. Birds Brit. Mus., XXI, 1893, p. 207.

Type, *Carpophaga forsteri* Temminck.....[*Treronidæ*.]

(A subgenus of *Carpophaga*).

Ζώνη, a belt, girdle; φάψ, a pigeon.

Zosterornis GRANT, Bull. Brit. Orn. Club, III, June 30, 1894, p. 1.

Type, *Zosterornis whiteheadi* Grant.....[*Timaliidæ*.]

Ζωστήρ, a girdle; ὄρνις, bird.

CATALOGUE OF GENERA MENTIONED IN THE FOREGOING LIST, ARRANGED BY FAMILIES.

[Fossil genera are indicated by italics.]

INCERTÆ SEDIS.

Alcatras.
Barornis.
Belornis.
Camaskelus.
Cimolopteryx.
Cryptornis.
Diatropornis.
Dolychoeix.
E'aphrocnemus.
Eupterornis.
Euryonotus.
Filholornis.
Idiornis.
Loxornis.
Ornithodesmus.
Orthocnemus.
Osteornis.
Protornis.
Rhagorhina.
Scaniornis.
Tachyornis.
Tapinopus.

ÆGIALORNITHIDÆ.

Ægialornis.

ÆPYORNITHIDÆ.

Flacourtia.
Mullerornis.

ALAUDIDÆ.

Chersophilus.
Corydon.
Eremopterix.
Etoimus.
Heliocorys.
Pseudalaemon.
Ptilocorys.

ALCIDÆ.

Endomychura.
Micruria.
Pseuduria.

ANATIDÆ.

Adelonetta.
Alopochen.
Asarcornis.
Centronis.
Chenornis.
Dafilula.
Elasmonetta.
Eoneornis.
Eutelornis.
Gennaecochen.
Hydrobates.
Ilyonetta.
Malacorhynchus.
Nesochen.
Nettalopex.
Plectrura.
Polionetta.
Prister.
Pteronetta.
Ptocas.
Salvadorina.
Serrator.

APTERYGIDÆ.

Metapteryx.
Pseudapteryx.

ARCHÆOPTERYGES.

Griphornis.
Griphosaurus.

ARDEIDÆ.

Ardeacites.

ARDEIDÆ—Continued.

Doriponus.
 Dupetor.
 Erythrocnus.
 Erythrophox.
 Glauceros.
 Heterocnus.
 Hydranassa.
 Leucophox.
 Melanophox.
 Mesophox.
 Notophox.
 Nycticorax.
Proherodius.
 Strycter.
 Styptes.
 Tigriornis.
 Xanthocnus.

ARTAMIDÆ.

Cataphania.

BUBONIDÆ.

Ascalaphia.
 Cetupa.
Necrobyas.
 Nyctalatinus.
 Nyctimene.
 Psilosops.
 Plynx.
 Scototheres.
 Tyto.

BUCEROTIDÆ.

Cassidix.
 Gymnolæmus.
 Horizocerus.
 Ortholophus.
 Ptilolæmus.
 Rhabdotorrhinus.

CACATUIDÆ.

Kakatoe.

CAMPEPHAGIDÆ.

Diaphoropterus.

CAPITONIDÆ.

Abelterus.
 Aleator.
 Cladurus.
 Erythrobucco.
 Geniates.
 Heliobucco.
 Lignobucco.
 Lybius.
 Melanobucco.
 Mezobucco.
 Pan.

CAPITONIDÆ—Continued.

Pogonites.
 Psilopus.
 Semnornis.
 Thereiceryx.
 Trachylæmus.

CAPRIMULGIDÆ.

Nannochordeiles.

CASUARIIDÆ.

Hypselornis.

CATHARTIDÆ.

Gymnogyps.

CHARADRIIDÆ.

Anomalophrys.
 Dilobus.
 Euhyas.
 Eurypterus.
 Gavia.
 Hyetoceryx.
 Lobibyx.
 Microsarcops.
 Peltohyas.
 Typanus.
 Zapterus.
 Zonifer.

CICONIIDÆ.

Amphipelargus.
 Diplocercus.
 Diplura.
Palæpelargus.
Pelargocrex.
Pelargodes.
Pelargopappus.
Pelargopsis.
Prociconia.
Propelargus.
 Tantalops.

CLADORNITHIDÆ.

Cladornis.

CEREBIDÆ.

Cyanerpes.

COLUMBIDÆ.

Amaurenas.
 Coccyzenas.
 Coelotreron.
 Coryphoenas.
 Dendrophaps.
 Dendrotreron.
 Dialiptila.
 Haploenas.
 Leucenas.
 Nesenas.
 Œoenas.

COLUMBIDÆ—Continued.

Palumbis.

Rupicola.

Sylvicola.

Trygon.

Tryzusa.

Tusalia.

COLYMBIDÆ.

Colymbetes.

CORACIIDÆ.

Geranopterus.

Uratelornis.

CORVIDÆ.

Cornix.

Galgulus.

Monedula.

Palæocorax.

COTINGIDÆ.

Alticeps.

Calvifrons.

Carnifex.

Perissocephalus.

Prospoietus.

Xenopsaris.

CRACES.

Gallinuloides.

CRACIDÆ.

Cumana.

CUCULIDÆ.

Clamator.

Dynamopterus.

Leptourus.

Metallococyx.

Urococyx.

CURSORIIDÆ.

Pratincola.

Rhimphalea.

DENDROCOLAPTIDÆ.

Deconychura.

Premnoplex.

DICÆIDÆ.

Acomorhynchus.

Rhodornis.

DICRURIDÆ.

Dissemurulus.

DINORNITHIDÆ.

*Anomalornis.**Megalapteryx.**Mesopteryx.*

Moa.

Movia.

*Pachyornis.**Palæo-casuaris.**Tylopteryx.*

DREPANIDÆ.

Chlorodrepanis.

Chrysomitridops.

Ciridops.

Dialis.

Drepanorhamphus.

Drepanorhynchus.

Palmeria.

Pseudonestor.

Rhodacanthis.

Rothschildia.

Telespyza.

Viridonia.

DROMORNITHIDÆ.

Genjornis.

ENALIORNITHIDÆ.

*Enaliornis.**Palæocolymbus.**Pelagornis.*

FALCONIDÆ.

Alectromorphnus.

Anopaia.

Asthenopterus.

Brewsteria.

Cymindus.

Elasas.

Erythrotriorchis.

Euhierax.

Foetopterus.

Gennadas.

Gymnops.

Halinertus.

Lagopterus.

Limnætus.

Necrastur.

Nesierax.

Oronertus.

Palætus.

Pithecophaga.

Poimaetus.

Spilospiza.

*Taphactus.**Thegornis.*

Tolmerus.

Tolmolestes.

FORMICARIIDÆ.

Calobamon.

Formicicapa.

Manikup.

Myrmochanes.

Rhopocichla.

Sclateria.

Thamnocharis.

FRINGILLIDÆ.

Arremonops.
 Brachyspiza.
 Clibanus.
 Cocornis.
 Compsospiza.
 Dictaea.
 Drepanorhynchus.
 Eurhinospiza.
 Geospiza.
 Hyphantospiza.
 Incaspiza.
 Lysurus.
 Melanospiza.
 Myospiza.
 Oreospiza.
 Perissospiza.
 Phaeospiza.
 Plagiospiza.
 Poospizopsis.
 Pselliophorus.
 Pseudostruthus.
 Rhodothraupis.
 Rhynchospiza.
 Rubricapilla.
 Schoeniclus.
 Serinopsis.
 Spermophilopsis.
 Stelgidostomus.

FURNARIIDÆ.

Aphrastura.
 Certhiaxis.
 Ipnodomus.
 Thryolegus.

GALBULIDÆ.

Hylaërops.

GASTORNITHIDÆ.

Remiornis.

GRUIDÆ.

Geranopsis.
 Limnogeranus.
Palæogrus.
 Pseudogeranus.
 Sarcogeranus.

HELIORNITHIDÆ.

Heliopais.

HESPERORNITHIDÆ.

Coniornis.

HIRUNDINIDÆ.

Antrochelidon.
 Chelidonaria.
 Herophilus.

HIRUNDINIDÆ—Continued.

Lecythoplastes.
 Riparia.

IBIDIDÆ.

Parnopio.

ICTERIDÆ.

Cirulus.
 Hylike.
 Ptiloxena.
 Zarhynchus.

INDICATORIDÆ.

Melignomon.
 Pseudofringilla.
 Pseudospiza.

JACANIDÆ.

Actophilus.
 Asarcia.
 Phyllopezus.

LANIIDÆ.

Abbottornis.
 Antichromus.
 Bocagia.
 Cosmophoneus.
 Eulacestoma.

LARIDÆ.

Chema.
 Dipsaleon.
 Einalia.
 Lambruschinia.
 Melanolarus.
 Melanosterna.
 Micranous.
 Potamochelidon.
 Pseudosterna.

LORIIDÆ.

Hypocharmosyna.

MEGAPODIDÆ.

Chosornis.
 Eulipoa.

MELIPHAGIDÆ.

Cleptornis.
 Entomyzon.
 Leptomyza.
 Myza.
 Neneba.
 Ptiloprora.
 Sarganura.

MICROPODIDÆ.

Aëronautes.
 Claudia.
 Pelasgia.

MIMIDÆ.

Allenia.
Buleites.
Mimetes.
Nesomimus.

MOMOTIDÆ.

Aspatha.
Electron.
Prionornis.

MUSCICAPIDÆ.

Bathmisyrra.
Callaeops.
Dammeria.
Hilarocichla.
Musciparus.
Myiosobus.
Ostiarus.
Pedilorrhynchus.
Pholia.
Stizorhina.

NECTARINIIDÆ.

Rhaphidornis.
Urodrepanis.

CEDICNEMIDÆ.

Milnea.

OTIDIDÆ.

Compsotis.
Heterotetrax.
Heterotis.
Houbaropsis.
Neotis.

PARADISEIDÆ.

Calastrapia.
Drepananax.
Eucorax.
Heteroptilorhis.
Janthothorax.
Lamprothorax.
Loboparadisea.
Macgregoria.
Paryphephorus.
Pteridophora.
Trichoparadisea.

PARAMYTHIIDÆ.

Paramythia.

PARIDÆ.

Anacrites.
Aphelocephala.
Brachyrynchus.
Pardaliparus.
Remiza.
Sceorhynchus.

PELECANIDÆ?

Liptornis.

PERISTERIDÆ.

Alopeccenas.
Calopelia.
Claravis.
Histriophaps.
Homopelia.
Leptopelia.
Micropelia.
Enopopelia.
Oxypelia.

PHAËTHONTIDÆ.

Prophaethon.

PHALACROCORACIDÆ.

Actiornis.
Argillornis.
Ecmeles.
Enygrotheres.
Gripeus.
Hydrocorax.
Leucocarbo.
Melanocarbo.
Nannopterum.
Pallasicarbo.

PHASIANIDÆ.

Agriocharis.
Alector.
Arquata.
Colinus.
Compsortyx.
Dactylortyx.
Dendrophila.
Gallina.
Houppifer.
Lochmophasis.
Mystoxydes.
Palæocryptonyx.
Plectroperdix.
Rhynchortyx.
Taoperdix.

PHŒNICOPTERIDÆ.

Elornis.

PICIDÆ.

Blacops.
Blax.
Crocomorphus.
Dryocolaptes.
Microstictus.
Nesocittes.
Piculus ST.-HILAIRE.
Piculus HODGSON.

PICIDÆ—Continued.

- Piculus BREHM.
Sapheopipo.

PIPRIDÆ.

- Scotothorus.

PITTIDÆ.

- Coracocichla.
Cyanopitta.
Galeripitta.
Insignipitta.
Mellopitta.
Monilipitta.
Ornatipitta.
Pulchripitta.

PLATALEIDÆ.

- Ibidopsis.*
Mystrorhamphus.
Protibis.

PLOCEIDÆ.

- Atalochrous.
Atopornis.
Brachycope.
Clytospiza.
Diatropura.
Drepanoplectes.
Granatina.
Haplopyga.
Heterhyphantes.
Hyperanthus.
Limoneres.
Lobospingus.
Lychnidospiza.
Nesacanthis.
Neshyphantes.
Oreospiza.
Oreostruthus.
Oryzivora.
Othyphantes.
Pachyphantes.
Penthetriopsis.
Stictospiza.
Stizoptera.

PODARGIDÆ.

- Cyphorhina.

PRIONOPIDÆ.

- Aerocharis.

PROCELLARIIDÆ.

- Halobates.

PSITTACIDÆ.

- Araclanga.
Bolbopsittacus.
Conuropsis.

PSITTACIDÆ—Continued.

- Dichrognathus.
Jaco.
Leptosittaca.
Necropsittacus.
Neophema.
Pionites.
Porphyreicephalus.
Spathopterus.

PTEROCLIDÆ.

- Pterygocys.

PTEROPTOCHIDÆ.

- Eugralla.
Onychornis.
Rhinornis.

PTILONORHYNCHIDÆ.

- Cnemophilus.
Loria.
Scenopœetes.
Tectonornis.
Xanthochlamys.

PUFFINIDÆ.

- Cymatobolus.
Zalias.

PYCNONOTIDÆ.

- Bostrycholophus.
Brachypus.
Centrolophus.
Cerasophila.
Elathea.
Pachycephalixus.
Phædrus.
Stelgidillas.
Stictognathus.
Xanthixus.

RALLIDÆ.

- Amaurolimnas.
Anurolimnas.
Aphanolimnas.
Aramidopsis.
Brachypteryx.
Calamodromus.
Castanolimnas.
Creccoides.
Crecopsis.
Diaphorapteryx.
Donacias.
Donacophilus.
Dryolimnas.
Erythrolimnas.
Galeolimnas.
Jonocicca.
Kittlitzia.

RALLIDÆ—Continued.

Lophophalaris.
 Microtribonyx.
 Nesolimnas.
 Œnolimnas.
 Ortygonax.
 Ortygops.
Palæolimnas.
 Pisynolimnas.
 Poliolimnas.
 Porphyriornis.
 Porzanula.
 Sarothrura.
 Stictolimnas.
 Tricholimnas.

RAMPHASTIDÆ.

Dinorhamphus.
 Machlostomus.
 Rhagoborus.
 Ulocomus.

RECURVIROSTRIDÆ.

Timeta.

SCOLOPACIDÆ.

Actia.
 Aegialodes.
 Falcinellus.
 Fedoa.
 Gambetta.
 Mesoscolopax.
 Pseudoglottis.
 Rhynchosimus.

SITTIDÆ.

Daphænositta.

SPHENISCIDÆ.

Palæospheniscus.
 Paraptenodytes.

STEREORNITHES.

(The genera of this group have been referred to several families, and in view of their unsettled classification they are here arranged under the order Stereornithes. The family name PHORORHACIDÆ Ameghino, 1895, is generally used for most of them, but the name STEREOORNITHIDÆ Moreno and Mercerat, 1891, antedates it.)

Ameghinia.
Anisolornis.
Brontornis.
Callornis.
Darwinornis.
Dryornis.
Liornis.

STEREORNITHES—Continued.

Lophiornis.
Mesembriornis.
Opisthodactylus.
Owenornis.
Palæociconia.
Patagornis.
Pelecyornis.
Phorusrhacos.
Physornis.
Pseudolarus.
Psilopterus.
Rostrornis.
Staphylornis.
Stephanornis.
Stereornis.
Titanornis.
Tolmodus.

STRIGIDÆ.

Badiostes.

STURNIDÆ.

Æthiopsar.
 Agropsar.
 Chalcopsar.
 Eumathes.
 Galeopsar.
 Hagiopsar.
 Heteropsar.
 Kittlitzia.
 Laceryzon.
Necropsar.
 Pecuarius.
 Perissornis.
 Poliopsar.
 Spodiopsar.
 Stilbopsar.

SULIDÆ.

Abeltera.

TANAGRIDÆ.

Hemithraupis.
 Heterospingus.
 Mitrospingus.
 Pseudospingus.
 Sporathraupis.

TETRAONIDÆ.

Palæotetrix.

THINOCORIDÆ.

Itys.

TIMALIIDÆ.

Allocotops.
 Alophoixus.
 Amalocichla.

TIMALIIDÆ—Continued.

Amaurocichla.
 Amytornis.
 Androphilus.
 Bathmocercus.
 Bleda.
 Bonapartia.
 Bowdleria.
 Cataponera.
 Chlorocharis.
 Cryptillas.
 Diaphorillas.
 Dybowskia.
 Eremiornis.
 Eurillas.
 Gymnocrotaphus.
 Hypocrites.
 Ifrita.
 Ixidia.
 Ixodes.
 Lanioturdinus.
 Lioparus.
 Lophozosterops.
 Marisca.
 Mesolophus.
 Mülleria.
 Nesillas.
 Ophrydornis.
 Oreoctistes.
 Phacelias.
 Pseudominla.
 Pseudotharrhaleus.
 Rectirostrum.
 Rhabdochlamys.
 Rhopocichla.
 Sittiparus.
 Stasiasticus.
 Thringorhina.
 Trichocichla.
 Zosterornis.

TINAMIDÆ.

Calopezus.

TRERONIDÆ.

Cryptophaps.
 Curotreron.
 Dendrophassa.
Lithophaps.
 Mezotreron.
 Phassa.
 Poecilotreron.
 Rhamphotreron.
 Rhombura.
 Terenotreron.
 Zonophaps.

TROCHILIDÆ.

Alcidius.
 Amazilia.
 Arinia.
 Bellona.
 Cyanolesbia.
 Gmelinius.
 Laticauda.
 Lawrencius.
 Leucuria.
 Lophomyia.
 Mychrorhynchus.
 Neolesbia.
 Psilomycter.
 Stephanoxis.
 Vestipedes.
 Warszewiczia.

TROGLODYTIDÆ.

Elachura.
 Hylorchilus.
 Spiloptera.

TROGONIDÆ.

Archæotrogon.
 Heterotrogon.
 Temnurus.

TURDIDÆ.

Amnicola.
 Emarginata.
 Horiozrhinus.
 Lophobasileus.
 Philomela.
 Phoenicurus.
 Psaltria.
 Scyrornis.
 Trochilus.
 Urophlexis.
 Zeledonia.

TURNICIDÆ.

Areortyx.

TYRANNIDÆ.

Deltarhynchus.
 Eribates.
 Horizopus.
 Myiopagis.
 Nesotriccus.
 Pseudomyobius.

VULTURIDÆ.

Capornis.
 Sarcogyps.
 Setogyps.
 Trigonoceph.

XENICIDÆ.

Traversia.

A REVIEW OF THE AMERICAN MOTHS OF THE GENUS
DEPRESSARIA HAWORTH, WITH DESCRIPTIONS OF
NEW SPECIES.

By AUGUST BUSCK,
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The genus *Depressaria* was established in the third volume of Haworth's *Lepidoptera Britannica*.¹ Since then numerous species have been discovered from nearly all parts of the world, though principally in the northern temperate regions and especially in Europe.

In America, Brackenridge Clemens described four species during the years 1860 to 1864, namely, *lecontella*, *atrodorsella*, *pulvipennella* and *cinereocostella*. These are true *Depressariæ* and easily recognized to-day.

Francis Walker, in his Catalogue of the Insects in the British Museum, described three species from America under the generic name *Depressaria*, namely, *confertella*,² *clausella*,³ and *georgiella*,⁴ of which, as Lord Walsingham has shown⁵ only *clausella* properly belongs to this genus and that name falls as a synonym of Clemens's *cinereocostella*.

In the Canadian Entomologist (1869) C. J. S. Bethune described and gave the life history of *Depressaria ontariella*. This was soon suspected by J. Angus to be the European *heracliana*, which was thus included in the American fauna. This was later proven by Zeller's positive determination.

In 1870 C. T. Robinson⁶ redescribed and figured Clemens's four species and added a new one, *Depressaria grotella*.

In the same year A. S. Packard, in his Guide, described and figured *Depressaria robiniiella*, giving its life history.

Zeller, in his Beiträge zur Kenntniss der nordamerikanischen Nachtfalter (1873), recognized and redescribed *atrodorsella* and *heracliana*,

¹ Page 505 (1812).

² Vol. XXIX, p. 563.

³ Vol. XXIX, p. 564.

⁴ Vol. XXXV, p. 1827.

⁵ Proc. Zool. Soc. Lond., 1881, p. 312.

⁶ Ann. Lyc. Nat. Hist. N. Y., IX, p. 156.

and added three species as new—*hilarella*, *scabella*, and *nebulosa*. Of these *hilarella* is clearly the same as Packard's *robiniella*, not known to Zeller.

V. T. Chambers described a number of species under the name *Depressaria* which did not belong there. Several of these he himself removed, and in his Index he only retained the foregoing of other authors and five of his own species, namely, *eupatoriella*, *fernaldella*, *pallidochrella*, *rileyella*, and *versicolorella*, the last three with a query and the note: "Probably to be referred to *Gelechia*." Of these only the first, *eupatoriella*, belongs to the genus, and this is now found to be the same species which Clemens described as *pulvipennella*; *fernaldella* is evidently *Machimia tentoriferella* Clemens, as determined by Professor Fernald and Lord Walsingham; *pallidochrella* belongs to the gelechiid genus *Gnorimoschema*, as Chambers's type in Cambridge proves; *rileyella* is found by the type in the U. S. National Museum to be a *Gelechia*, and *versicolorella*, while not at present recognized with certainty, is evidently a gelechiid from Chambers's note on that species and *pallidochrella*: "Posterior wings deeply emarginate beneath the apex."

Two other species of Chambers's, however, described under *Gelechia*, namely, *thoracenigraella* and *thoracefasciella*, are found on examination of the authentic types in the Cambridge Museum to belong to *Depressaria*, and one other species, placed by Chambers under *Gelechia*, namely, *clemensella*, has been identified by Lord Walsingham as *Depressaria applanata* Fabricius, of Europe.

In 1881 Lord Walsingham¹ reviewed the genus and included the species in Chambers's Index, besides describing and figuring eight new species, namely, *sabulella*, *argillacea*, *arnicella*, *klamathiana*, *posticella*, *nubiferella*, *psoralicella*, and *umbraticostella*. He also recognized from this country five European species, namely, *ciliella* Stainton, *yeatiana* Fabricius, *nervosa* Haworth, *emeritella* Stainton, and *parilella* Treitscke, the latter with some hesitation, and providing the name *novi-mundi* for his specimens if it should prove a distinct species. Of these the supposed *yeatiana* Fabricius was afterwards² redetermined by Walsingham as the European *arenella* Schifferrmiller, and the *novi-mundi* it will be safer to regard as a distinct species at present, though Lord Walsingham seems to think³ that it may be one of the many varieties of *parilella*.

In 1882 Lord Walsingham⁴ further added the new species *fulva*.

In 1883 D. W. Coquillett⁵ added a valuable contribution to our knowledge of the genus by publishing the life histories and food plants of four species, namely, *pulvipennella*, *atrodorsella*, *grotella*, and what was supposed to be *hilarella*.

¹ Proc. Zool. Soc. Lond., p. 311-319.

⁴ Trans. Ent. Soc. Phila., 1882, p. 175.

² Trans. Ent. Soc. Phila., 1882, p. 175.

⁵ Papilio, III, p. 98.

³ Insect Life, I, p. 256.

This latter determination, however, was undoubtedly wrong, as the food plant of *hilarella* (*robiniella* Packard) is *Robinia pseudacacia*, as noted by both Zeller and Packard, and though many species have more than one food plant, it is improbable that one should feed on such different plants as *Robinia* and *Sanicula*, from which Mr. Coquillett bred his species.

In 1889 Lord Walsingham¹ further described five species as new, namely, *togata*, *solidaginis*, *fernaldella*, *lythrella*, and *gracilis*, of which, however, *solidaginis* is found to be the same as *pulvipennella* (*eupatoriella* Chambers), and as the name *Depressaria fernaldella* had been previously employed, though wrongly, for another insect by Chambers, Walsingham's species of that name requires a new name; it may be known as *Depressaria walsinghamella*.

In the same paper Walsingham recorded from America the European *Depressaria ciniflonella* Zeller.

Miss Murtfeldt described² a *Depressaria persicælla*; but, as she has herself shown later,³ this is not a *Depressaria*, but a *Gelechia*.

Finally, William Beutenmüller has described one species, *curvilineiella*;⁴ and the writer has described⁵ one species from Florida, *amyrisella*.

To these are now added six new species in this paper, making a total of thirty-nine species of *Depressaria* recognized at present from America. As, however, our fauna of Tineina has only been collected very incompletely, in few and limited localities, this number will eventually be much enlarged. In the U. S. National Museum, for example, are more than a dozen forms, which can not be referred to any described species. These are not in sufficient numbers and are in too poor condition to justify description at present.

The genus *Depressaria* belongs to the family Cœphoridæ, and may be recognized by the following characters: Antennæ about three-fourths as long as forewing, simple or slightly serrate; basal joint long with well-developed pecten. Labial palpi long, recurved; second joint beneath with heavy, rough, furrowed brush of scales; terminal joint shorter than second, pointed. Thorax often more or less crested; abdomen strongly flattened. Forewings elongate, three to four times longer than broad, apex obtuse, generally rounded, termen not very oblique; 12 veins, 7 and 8 stalked, to costa, 2 and 3 separate or stalked. Hindwings as broad or somewhat broader than forewings, oblong ovate to triangular, rounded; 8 veins, 8 not connected with cell, 6 and 7 parallel, 5 more or less approximate to 4, 3 and 4 connate or shortly stalked; cilia less than half the width of wing.

The larvæ are cylindrical or somewhat depressed, often prettily marked, with three pairs of normal thoracic feet and five pairs of

¹ Insect Life, I, 254-257.

⁴ Ent. Am., V, 1889, p. 10.

² Rep. Mich. Sta. Agr. Coll., 1899.

⁵ Proc. U. S. Nat. Mus., XXIII, 1900, p. 233.

³ Can. Ent., XXXII, p. 164.

abdominal prolegs; tubercles well developed, normal, iv and v approximate or united, shields well developed. They feed in folded or rolled leaves or in the flower heads especially of Umbelliferae and Compositae, and pupate in the stems of the food plant or among rubbish on the ground.

The imagos are very retired in their habits and not frequently seen; most [or all?] of the species overwinter as imago.

The species fall naturally in two groups, the first with veins 2 and 3 in forewings stalked, the other with 2 and 3 separate. The first group has generally the base of the forewings of a lighter shade than the ground color of the wing, which shade often is continued along the basal part of costa and is sharply limited by a dark perpendicular streak or shadow from the inner margin two-thirds across the wing; while the insects of the other group generally lack the pale basal marking, but have a whitish, dark-edged streak along the base of the dorsal edge; but there are several exceptions in both groups.

Some of the species are very similar and difficult to distinguish from each other; but the recognized American species may be separated by the following synoptic table.

Only the American synonyms are mentioned in the following pages, and European references to such species as are common to America and Europe are given only by the number of the species in Staudinger and Rebel's Catalog der Lepidopteren des Palæarctischen Faunengebietes.	
Forewings with veins 2 and 3 stalked	1
Forewings with veins 2 and 3 separate	30
1. Base of forewings black [or dark brown]	2
Base of forewings not black	5
2. Forewings with black costal markings	3
Forewings without such markings	4. <i>gracilis</i> .
3. Forewings with white dot at end of cell	1. <i>atrodorsella</i> .
Forewings without such dot	4
4. First discal spot a large comma-shaped streak	3. <i>thoracnigrælla</i> .
First discal spot a small dot	2. <i>umbraticostella</i> .
5. Second discal spot at end of cell wholly or partly white	6
With no white in second discal spot	22
6. First discal spot wholly or partly white	7
With no white first discal spot	13
7. Ground color of wings greyish; extreme tip of palpi light	8
Ground color of wings reddish; extreme tip of palpi black	10
8. Brush on second joint of palpi large and much wider at tip than at the base.	
	17. <i>nebulosa</i> .
Brush on second joint of palpi narrow and of about even width in its entire length	9
9. With distinct black line preceding second discal spot	16. <i>ciniflonella</i> .
Without such line	15. <i>klamathiana</i> .
10. With two obliquely placed black dots in disk	11
Without such dots	12. <i>psoralisella</i> .
11. With indistinct angulated pale fascia	12
Without fascia	11. <i>walsinghamella</i> .

12. Cilia of hindwings tinged with reddish	10. <i>ciliella</i> .
Cilia of hindwing not reddish	9. <i>applana</i> .
13. With large curved black line on disk	21. <i>curvilineella</i> .
Without such line	14
14. With large thoracic crest	19. <i>amyrisella</i> .
Without such crest	15
15. With pronounced row of dark spots round apical edge	16
Without such row	19
16. With dark cloudy area above second discal spot	17
Without such dark area	14. <i>thoracefasciella</i> .
17. Basal part of costa much lighter than rest of wing	6. <i>arnicella</i> .
Basal part of costa not or only slightly lighter	18
18. Second discal spot containing only a single white scale	18. <i>fulva</i> .
Second discal spot containing a round white dot	5. <i>pulvipennella</i> .
19. Ground color gray	20
Ground color purplish fuscous or brown	13. <i>novi-mundi</i> .
20. With red scales around second discal spot	8. <i>sanguinella</i> .
Without red scales around second discal spot	21
21. Hindwing whitish	7. <i>argillacea</i> .
Hindwing dark gray	20. <i>muricolorella</i> .
22. With blackish dorsal patch at anal angle	27. <i>posticella</i> .
Without such patch	23
23. With continuous blackish line before cilia	24
With series of dots along apical edge	25
24. With curved black spot on disc	26. <i>lythrella</i> .
Without such spot	28. <i>nubiferella</i> .
25. Forewings grayish ochereous	26
Forewings tawny reddish	29
26. Forewings with rosy tint	25. <i>canadensis</i> .
Forewings not rosy	27
27. Forewings with single black spot at end of disk	28
Forewings with two black spots at end of disk	23. <i>sabulella</i> .
28. With conspicuous dark area between and above discal spots	24. <i>arenella</i> .
Such area absent or only slightly indicated	22. <i>semiciella</i> .
29. With dark triangular shade at the end of disc	29. <i>robinella</i> .
Without such shade	30. <i>lecontella</i> .
30. Forewings with raised scales	39. <i>scabella</i> .
Without raised scales	31
31. With base of wing and costal edge whitish	38. <i>cinereocostella</i> .
Base of wing and costa not whitish	32
32. With pale second discal spot	33
Without such spot	36
33. Second discal spot conspicuously white and preceded by longitudinal white line	31. <i>emeritella</i> .
Second discal spot not conspicuous and not preceded by white line	34
34. With thin, interrupted longitudinal white line from basal third of costa, crossing costal veins	35. <i>barberella</i> .
Without such line	35
35. With hindwings whitish	32. <i>togata</i> .
With hindwings fuscous	33. <i>betulella</i> .
36. With distinct blackish terminal dots	37
Terminal dots not separate	34. <i>nervosa</i> .
37. With pale acutely angulated fascia	36. <i>heracliana</i> .
Without such fascia	37. <i>grotella</i> .

1. *DEPRESSARIA ATRODORSELLA* Clemens.

Drepressaria atrodorsella CLEMENS, Proc. Ent. Soc. Phila., II, 1863, p. 124.—ROBINSON, Ann. Lyc. Nat. Hist. N. Y., IX, 1870, p. 156, pl. 1, fig. 7.—PACKARD, Guide Stud. Ins., 1870, p. 349.—CLEMENS, Stainton's Tin. Nor. Am., 1872, p. 230.—CHAMBERS, Can. Ent., IV, 1872, p. 91.—ZELLER, Verh. Zool. Bot. Ges. Wien., 1873, p. 233.—CHAMBERS, Bull. U. S. Geol. Surv. Terr., IV, 1878, p. 138.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 312.—COQUILLET, Papilio, III, 1883, p. 98.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5255.—DIETZ, Smith's Cat. Ins. N. J., 1900, p. 473.

Foodplant.—*Bidens frondosa*.

The larva is green, with dorsal and subdorsal stripes of very dark green, blackish or brown; piliferous spots and spiracles dark brown or black; head yellowish-brown, with two black lateral dots; thoracic shield yellowish-green, with a black spot on the middle of each outer edge. Length, 18 mm. It folds the leaf lengthwise. [Coquillett.]

In the U. S. National Museum collection are specimens from the District of Columbia; New York, a specimen from Asa Fitch's collection, with his manuscript name "*manella*" attached, and one from Connecticut (Beutenmüller).

2. *DEPRESSARIA UMBRATICOSTELLA* Walsingham.

Depressaria umbraticostella WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 318, pl. xxxvi, fig. 8.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5283.

Foodplant.—*Helianthus pumilus*.

In the U. S. National Museum are cotypes received from Lord Walsingham, collected in Oregon in 1872. Also other specimens from Arizona and California, named by him; a specimen from Placer County, California (Coquillett); California (Beutenmüller), and a bred specimen reared in Colorado by Dr. Dyar, who has kindly handed me the following notes on the larva:

Head elongate, half retracted in joint 2, black, rather dull, the clypeus brownish; width about 1 mm. Body moderately slender, the incisures distinct, rather flattened, all black; tubercles large, elevated, rounded, all conspicuously white ringed; iv and v united; on the thorax ia+ib and iia+iiib. Shields black, concolorous, the feet shining. Abdominal feet moderate, normal.

Lives on *Helianthus pumilus*, webbing up the head of the growing shoot and partly mining in the leaf.

Found near Denver and Sedalia, Colorado.

3. *DEPRESSARIA THORACENIGRÆELLA* Chambers.

Gelechia thoracenigræella CHAMBERS, Cin. Quart. Jour. Sc., II, 1875, p. 246; Bull. U. S. Geol. Surv. Terr., IV, 1878, p. 147.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5495.

The type of this species, labeled by Chambers and conforming with his description, is in the Museum of Comparative Zoology at Cambridge, Massachusetts, where I had an opportunity to examine it in

May, 1900. It proves that the species belongs to *Depressaria* and is unlike any other described species of that genus.

It is easily recognized among the few species, which have the base of the wing black by the oblique streak on middle of disk. I have met with no other specimen of the species. It was described from California (Behrens).

4. *DEPRESSARIA GRACILIS* Walsingham.

Depressaria gracilis WALSINGHAM, Insect Life, I, 1899, p. 257.

Of this very distinct species I have recognized a specimen from Colorado in the collection of the U. S. National Museum. The species was described from Texas.

5. *DEPRESSARIA PULVIPENNELLA* Clemens.

Depressaria pulvipennella CLEMENS, Proc. Ent. Soc. Phil., II, 1864, p. 421.—ROBINSON, Ann. Lyc. Nat. Hist. N. Y., IX, 1870, p. 157, pl. I, fig. 8.—CLEMENS, Stainton's Tin. Nor. Am., 1872, p. 244.—CHAMBERS, Can. Ent., IV, 1872, p. 91; Bull. U. S. Geol. Surv. Terr., 1878, p. 138.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 312.—COQUILLETT, Papilio, III, 1883, p. 97.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5270.

Depressaria eupatoriella CHAMBERS, Bull. U. S. Geol. Surv. Terr., 1878, pp. 82, 138.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 312.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5262.

Depressaria solidaginis WALSINGHAM, Insect Life I, 1889, p. 255.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5281.

Depressaria fulvipennella DIETZ, Smith's Cat. Ins. N. J., 1900, p. 474.

Food plants.—*Eupatorium* and *Solidago*.

The larva is green, sometimes with darker dorsal line and subdorsal stripe; piliferous spots green; cervical shield green with a black dot on each outer edge; anal plate edged behind with black; spiracles brown; head green, dotted or mottled with pale brown and marked with a dot on each side above the jaws; length 17–18 mm. It rolls the leaf lengthwise. [Coquillett.]

In the U. S. National Museum are specimens received from Miss Murtfeldt, from the series bred by her from *Solidago*, from one of which Lord Walsingham described his *Depressaria solidaginis*. There are other specimens, labeled by Walsingham "*pulvipennella* Clemens" and "*eupatoriella* Chambers," and one labeled by him "*pulvipennella* Clemens, must be very near *eupatoriella* Chambers;" other specimens, bred in the insectary of the U. S. Department of Agriculture from *Eupatorium* and from *Solidago*. All of these represent undoubtedly only one species, which, however, is somewhat variable in the intensity of the dark markings; the different descriptions also bear out the synonymy.

Habitat.—District of Columbia, Pennsylvania, New York, Illinois, and Missouri.

6. *DEPRESSARIA ARNICELLA* Walsingham.

Depressaria arnicella WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 314, pl. xxxvi, fig. 3.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5254.

Food plant.—*Arnica angustifolia*.

In the U. S. National Museum is a bred cotype from Mount Shasta, California, received from Lord Walsingham.

7. *DEPRESSARIA ARGILLACEA* Walsingham.

Depressaria argillacea WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 313, pl. xxxvi, fig. 2.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5252.

Cotypes from California are in the U. S. National Museum, received from Lord Walsingham; also a specimen from Connecticut (Beutenmüller), which I can not distinguish from this species.

It is very close to *Depressaria yeatiana* Fabricius, though lacking the pronounced row of dark spots before the cilia.

8. *DEPRESSARIA SANGUINELLA*, new species.

Antennæ dark fuscous. Labial palpi light grayish ochereous, second joint evenly speckled with black scales on the outside, terminal joint reddish with a small black spot in front near base and with extreme tip black. Face, head and collar of thorax light straw color; thorax and forewings gray with a carmine tint, especially along costal edge and in the apical part of the wing. An indistinct lighter basal field is slightly edged with blackish scales and the extreme base of costa is black. A small black spot in the middle of the disk and a similar one obliquely above and nearer base of wing are surrounded by a few bright carmine scales. At the end of the cell is a small round white dot, conspicuously edged with carmine scales; from this second discal spot is a short, oblique streak of blackish scales directed inward and upward, but not reaching costa. Sparse black and reddish scales are scattered over the wing; cilia reddish grey, sprinkled with black. Underside of wing dark fuscous, with costal edge reddish and the apical edge light ochereous, containing a row of small black dots.

Hind wings light ochereous fuscous, underside sprinkled with sparse black dots; cilia with indistinct dark line at base and two still less pronounced lines parallel with the edge of the wing.

Abdomen light ochereous, the underside sprinkled with black scales and with two longitudinal rows of black dots. Legs yellow, shaded with black.

Alar expanse: 21 mm.

Habitat.—Pinal Mountains, Arizona. (R. Kunzé.)

Type.—No. 6129, U.S.N.M.

This species is near *Depressaria argillacea* Walsingham, but easily distinguished by the red coloration and the well-defined oblique line

from second discal spot instead of the indistinct dark area found in *argillacea*. I am indebted to Mr. W. D. Kearfott for the specimen.

9. *DEPRESSARIA APPLANA* Fabricius.

Depressaria applana FABRICIUS; STAUDINGER and REBEL, Cat. Lep. Eur., II, 1901, No. 3233.—WALSINGHAM, Trans. Amer. Ent. Soc. Phila., 1882, p. 175.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5251.

Gelechia clemensella CHAMBERS, Can. Ent., VIII, 1876, p. 173.—CHAMBERS, Bull. U. S. Geol. Surv. Terr., IV, 1878, p. 142.

Food plant.—*Heracleum*, etc.

The larva is green, with dorsal and subdorsal lines darker; dots black; head gray-green; first thoracic segment with two blackish green crescentic marks. It feeds in rolled leaves. [Meyrick].

Besides a large European series of this species there are in the U. S. National Museum two specimens from the District of Columbia, agreeing with Chambers's type of *Gelechia clemensella* in the Cambridge Museum; one of these bears Walsingham's label: "I am unable to distinguish this form from the common European *Depressaria applana*." These specimens do not seem to me identical with European specimens, being smaller than the average and more reddish along the costa, besides nearly wanting the white scales after first discal dot. However, they are very near.

If the species be bred in this country it can be determined definitely whether they are distinct or not.

I have met with no typical specimen of *Depressaria applana* from America.

10. *DEPRESSARIA CILIELLA* Stainton.

Depressaria ciliella STAINTON; STAUDINGER and REBEL, Cat. Lep. Eur., II, 1901, No. 3234.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 316.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5257.

Food plant.—*Daucus*, etc.

The larva resembles that of the foregoing (*Depressaria applana*), but the head is ocherous-yellowish. [Meyrick]. One rather faded specimen determined and labeled by Lord Walsingham is in the U. S. National Museum, besides a European series. This species is very close to *Depressaria applana* and difficult to separate from it.

11. *DEPRESSARIA WALSINGHAMELLA* Busck.

Depressaria fernaldella WALSINGHAM, Insect Life, I, 1889, p. 256.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5262a.

[Not *Depressaria fernaldella* CHAMBERS, Bull. U. S. Geol. Surv. Terr., IV., 1878, pp. 82 and 138.]

The type of this species is in the collection of Professor Fernald, where, through his kindness, I have had an opportunity of examining it. An identical specimen from Ontario (A. W. Hanham) is in the U. S. National Museum. The species is very close to the fol-

lowing, *Depressaria psoraliiella*. I am indebted to Dr. Dyar for calling my attention to the invalidity of Lord Walsingham's name, *fernaldella*.

12. *DEPRESSARIA PSORALIELLA* Walsingham.

Depressaria psoraliiella WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 317, pl. xxxvi, fig. 7.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5275.

Food plant.—*Psoralea physodes*.

A bred cotype from Sonoma County, California, received from Lord Walsingham, is in the U. S. National Museum collection.

13. *DEPRESSARIA NOVI-MUNDI* Walsingham.

Depressaria parilella, var. *novi-mundi* WALSINGHAM, Proc. Zool. Soc. Lond., 1881, pp. 317-318; Insect Life, I, 1889, p. 256.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5273.

One specimen, collected at Mount Shasta, California, by Lord Walsingham, and labeled by him "*Depressaria parilella*, var. *novi-mundi*," is in the U. S. National Museum. It does not agree with any specimen of *Depressaria parilella* Treitschke known to me, and I think it safer to regard it, for the present at least, as a distinct species, of which the above specimen should be regarded as a cotype.

14. *DEPRESSARIA THORACEFASCIELLA* Chambers.

Gelechia thoracefasciella CHAMBERS, Cin. Quart. Journ. Sc., II, 1875, p. 246; Can. Ent., X, 1878, p. 50; Bull. U. S. Geol. Surv. Terr., IV, 1878, p. 147.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5494.

The type of this species is in rather poor condition but agrees well with Chambers's description. It is found with his label in the Cambridge Museum. It is a *Depressaria* distinct from any other described species. The type came from California (Behrens); I have met with no other specimen.

15. *DEPRESSARIA KLAMATHIANA* Walsingham.

Depressaria klamathiana WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 314, pl. xxxvi, fig. 4.—RILEY, Smith's List Lep. Bor. Am., No. 5267, 1891.

A cotype from Oregon, received from Lord Walsingham, is in the U. S. National Museum; also another specimen, from California, thus determined by Walsingham, which differs slightly from the type and description; it is possibly a variety.

16. *DEPRESSARIA CINIFLONELLA* Zeller.

Depressaria ciniflonella ZELLER; STAUDINGER and REBEL, Cat. Lep. Eur., II, 1901, No. 3221.—WALSINGHAM, Insect Life, I, 1889, p. 256.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5259.

Food plant.—*Betula*.

The larva is purple brown; the spots black; head pale reddish, thoracic plate blackish; it feeds in folded leaves of birch. [Meyrick.]

In the U. S. National Museum is one of the three specimens from Vancouver Island, on which Lord Walsingham added *Depressaria ciniflonella* Zeller to the American list, besides European specimens.

17. *DEPRESSARIA NEBULOSA* Zeller.

Depressaria nebulosa ZELLER, Verh. Zool. Bot. Ges. Wien, 1873, p. 237.—CHAMBERS, Bull. U. S. Geol. Surv. Terr., IV, 1878, p. 138.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 312.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5269.

In the U. S. National Museum is a specimen of this species with Zeller's label; also others from New York, Pennsylvania, and Massachusetts.

18. *DEPRESSARIA FULVA* Walsingham.

Depressaria fulva WALSINGHAM, Trans. Amer. Ent. Soc. Phila., 1882, p. 175.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5251.

I have examined the type of this species in Professor Fernald's collection. A single specimen, determined by Mr. Beutenmüller, is in the U. S. National Museum collection.

19. *DEPRESSARIA AMYRISELLA* Busck.

Depressaria amyrisella BUSCK, Proc. Nat. Mus., XXIII, 1900, p. 233, pl. 1, fig. 8.—DYAR, Proc. Ent. Soc. Wash., IV, 1901, p. 476.

Food plant.—*Amyris floridana*.

Type.—No. 4941, U.S.N.M.

The strongly crested thorax in this species is an easy distinguishing character.

Habitat.—Palm Beach, Florida (Dyar.)

The larva is yellowish, shaded with red, the food showing green; cervical shield pale orange; thoracic feet pale; tubercles small, dark; head bilobed, shining black. Lives in a folded leaf, with a rounded opening for emergence. [Dyar.]

20. *DEPRESSARIA MURICOLERELLA*, new species.

Antennæ dark ochreous gray without annulations. Labial palpi dark ochreous on the outside, evenly sprinkled with single black scales; inside of palpi and face light ochreous. Head and thorax grayish brown. Forewings dark mouse gray, toward the apex and round the edges with a purple tint and irregularly sprinkled with sparse, single, black scales; base and basal part of costa somewhat lighter than rest of wing, concolorous with thorax. First discal spot indicated by a collection of a few black scales; second discal spot at end of cell a white dot, edged on the outside by a narrow semicircle of black scales. Cilia a shade lighter than wing, and especially in the dorsal part tinged with

ochreous. Hindwings shining, dark gray, cilia lighter. Veins 3 and 4 in hindwings are shortly stalked. Legs ochreous, shaded with black; abdomen dark purplish grey, lighter on the under side and with ochreous scales intermixed.

Alar expanse.—17 mm.

Habitat.—Colorado.

Type.—No. 6125, U. S. N. M.

Foodplant.—"An umbelliferous plant." A very distinct species easily recognized by its uniform dark appearance.

Dr. Dyar has prepared the following notes on the larva:

Head bilobed, shining black, epistoma paler; shield luteous, black in a broad posterior-lateral rim and anterior spot. Body normal, the incisures depressed; green, translucent; segments obscurely 3-annulate, the subventral fold distinct. Tubercles slightly elevated, concolorous; ia and ib separate, iia and iib approximate, iv + v, normal. Hair tubercles black; setae long, pale. No marks, but all the dorsum shaded with red when about to pupate. Lives on a species of umbelliferae, webbing the leaves. Found on the foothills back of Golden, Colorado.

21. *DEPRESSARIA CURVILINIELLA* Beutenmüller.

Depressaria curviliiniella BEUTENMÜLLER, Ent. Am., V, 1889, p. 10.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5260.—DIETZ, Smith's Cat. Ins. N. J., 1900, p. 474.

U. S. National Museum type No. 441 of this species, obtained from Beutenmüller, and a specimen from Ontario (A. W. Hanham) are in the U. S. National Museum. This fine species can not easily be mistaken for any other *Depressaria*. It reminds one somewhat of *Semioscopis packardella* Clemens,¹ by the striking curved discal line.

22. *DEPRESSARIA SENICIONELLA*, new species.

Antennae ochreous with narrow black annulations. Labial palpi light ochreous, second joint sprinkled with white and black scales; terminal joint with an annulation at base, one round the middle and the extreme apex black. Face and tongue very light yellowish, nearly white; head and thorax light ochreous. Forewing dark ochreous gray, mottled with lighter ochreous and sparsely sprinkled with black and white scales. Base of wing concolorous with thorax, light ochreous and rather sharply edged outwardly by an area of somewhat darker shade than the rest of the wing. In the middle of the cell is a more or less conspicuous black dot, often preceded by a similar dot nearer costa; at the end of the cell is an inconspicuous black dot, and between and above these dots is in most specimens a faint dark fuscous area. Along costa and round apical edge is a series of more or less pronounced blackish dots, and the veins are in most specimens slightly indicated by interrupted rows of dark scales, with the intervals rather light unspotted ochreous.

¹ *Enicostoma? packardella* Clemens, Smith's List Lep. Bor. Am., 1891, No. 5290.

Hindwing shining dark gray with a faint blackish line at apex before the cilia, which are a shade lighter than the wing. Abdomen grayish ochereous with two longitudinal rows of black dots on the under side. Legs light ochereous with spurs and tarsal joints sparsely sprinkled with black scales.

Alar expanse.—17 mm.

Habitat.—District of Columbia, Virginia.

Type.—No. 6126, U.S.N.M.

Foodplant.—*Senecio aureus*.

The larva is of a dirty yellowish color with head, thorax, and anal plates black; tubercles very small, black, emitting short white hairs.

It rolls and later spins together the young leaves of *Senecio aureus*. It is one of the earliest micros met with in this locality; the young larva can be found in March, and the imago issues late in April and during May.

This species is near to *Depressaria arenella* Schiffermiller, and it is not easy to give definite differences, though the two are decidedly distinct, *seneciella* being a smaller and darker insect, not so conspicuously marked, and with relatively broader and more perpendicularly cut forewings.

I have bred *seneciella* in large series, and it is somewhat variable in the distinctness of the markings.

23. *DEPRESSARIA SABULELLA* Walsingham.

Depressaria sabulella WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 313, pl. xxxvi, fig. 1.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5279.

This species was described from a single collected specimen from Mendocino County, California, and is, according to Walsingham, allied to the European *Depressaria subpropinquella* Stainton. The careful description and figure should make it recognizable when seen, but no specimen is found in the U. S. National Museum, and I am unacquainted with the species except through the description.

24. *DEPRESSARIA ARENELLA* Schiffermiller.

Depressaria arenella SCHIFFERMILLER; STAUDINGER and REBEL, Cat. Lep. Eur., II, 1901, No. 3204.—WALSINGHAM, Trans. Amer. Ent. Soc. Phila., 1882, p. 175.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5253.

Depressaria yeatiana WALSINGHAM, (not FABRICIUS) Proc. Zool. Soc. Lond., 1881, p. 316.

Foodplant.—*Centaurea*, etc.

The larva is green, paler laterally, with dorsal and subdorsal lines dark green; dots blackish; head light brownish-ochereous; first thoracic segment with two blackish spots. It lives in folded leaves [Meyrick].

This species, recorded by Lord Walsingham from Texas and Oregon, I have not met with in American specimens, but a fine series of European specimens is in U. S. National Museum.

25. *DEPRESSARIA CANADENSIS*, new species.

Antennæ dark fuscous with narrow indistinct black annulations. Labial palpi light ochreous, second joint evenly sprinkled with black on the outside; terminal joint with two broad black annulations, one at base and one at the middle and with extreme tip black. Face and tongue creamy white; head and thorax light grayish ochreous with a few darker reddish scales intermixed. Forewings light yellowish gray suffused with dark ochreous fuscous and liberally sprinkled with black; there is a perceptible rosy tint, particularly at base of dorsal edge, on the middle of the wing and at apical half of costal edge. In the middle of the disk is a conspicuous black dot preceded by a similar one nearer costa; at the end of the cell is another black dot surrounded by smaller groups of black scales; between these dots is an area of black, not strongly defined and tinted round the edges with rose. Costal edge irregularly spotted with black and around the apical edge a pronounced row of black dots.

Hindwings light whitish fuscous, cilia nearly white; on the under-side of the hindwing is an interrupted black line around the edge and an irregular sprinkling of black dots in the apical part.

Alar expanse.—17 mm.

Habitat.—Winnipeg, Manitoba. (A. W. Hanham.)

Type.—No. 6127, U.S.N.M.

This species resembles somewhat *Depressaria arenella* Schiffermiller, but is a smaller and much more mottled insect.

26. *DEPRESSARIA LYTHRELLA* Walsingham.

Depressaria lythrella WALSINGHAM, Insect Life, I, 1889, p. 257.

Foodplant.—*Lythrum alatum*.

I am unacquainted with this species, except from the description.

Habitat.—Illinois

27. *DEPRESSARIA POSTICELLA* Walsingham.

Depressaria posticella WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 315, pl. xxxvi, fig. 5.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5274.

Foodplant.—*Psoralia physodes*.

Of this fine species, easily recognized by the anal dark cloud, the U. S. National Museum possesses a cotype from California, received from Lord Walsingham. There is also a series, bred by Mr. E. A. Schwarz, at Fresno, California, with larvæ found by him on *Psoralia*, and a series bred in Colorado by Dr. Harrison G. Dyar, who has kindly communicated the following notes on the larva:

Head rounded, bilobed; shields large, anal plate and thoracic feet black. Body dark, sordid, olivaceous green, the tubercles distinct, black, white ringed; joint 2 pale in front. Tubercles iv and v in line, approximate, separated, but in a common

white area; on joints 3 and 4 tubercles ia, ib, iia+b in a common white area, ia and ib well separated; iv and v united. Setæ brownish; anal footplates black. Head faintly diluted testaceous on the faces of the lobes.

Lives on *Psoralea tenuifolia*, uniting the leaflets together with silk into a sort of case and eating the inner portions of the leaves.

Found on the prairie near Denver and Golden, Colorado.

28. *DEPRESSARIA NUBIFERELLA* Walsingham.

Depressaria nubiferella WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 316, pl. xxxvi, fig. 6.

Foodplant.—*Hypericum*.

This also is a striking species, easily recognized from Lord Walsingham's careful description and figure.

In the U. S. National Museum is a cotype, bred from *Hypericum* in Oregon by Lord Walsingham.

29. *DEPRESSARIA ROBINIELLA* Packard.

Depressaria robinella PACKARD, Guide Stud. Ins., 1870, p. 349, pl. viii, fig. 14.—CHAMBERS, Can. Ent., IV, 1872, p. 107; Cin. Quart. Journ. Sc., I, 1874, p. 208.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 312.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5278.

Depressaria hilarella ZELLER, Verh. Zool. Bot. Ges. Wien., 1873, p. 234.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 312.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5266.—DIETZ, Smith's Cat. Ins. N. J., 1900, p. 474. [not *Depressaria hilarella* COQUILLETT, Papilio, III, 1883, p. 98.]

Foodplant.—*Robinia pseudacacia*.

There can be no doubt about the synonymy of these two forms *robinella* and *hilarella*, the descriptions of which tally and both of which were recorded from *Robinia*. In the U. S. National Museum is a specimen with label "*Depressaria hilarella*" in Zeller's handwriting. Also other specimens from the District of Columbia, Virginia, New York, and Massachusetts.

The species which Mr. Coquillett bred from *Sanicula marilandica*¹ can hardly be this species; some mistake must have been made in the determination. It may possibly have been the very similar *Depressaria leconteella* Clemens, the foodplant of which is as yet unknown.

30. *DEPRESSARIA LECONTELLA* Clemens.

Depressaria leconteella CLEMENS, Proc. Acad. Nat. Sc. Phila., 1860, p. 174.—ROBINSON, Ann. Lyc. Nat. Hist., IX, 1870, 157, pl. i, fig. 9.—CLEMENS, Stainton's Tin. Nor. Am., 1872, p. 137.—CHAMBERS, Can. Ent., IV, 1872, p. 146; Bull. U. S. Geol. Sur. Terr., IV, 1878, p. 138.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 312.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5268.—DIETZ, Smith's Cat. Ins. N. J., 1900, p. 474.

Very near the preceding species, *Depressaria robinella* Packard, but larger, paler, and lacking the triangular dark shade on the forewings.

¹ Papilio, III, 1883, p. 98.

A specimen in the U. S. National Museum with Zeller's label "mir unbekant;" other specimens from New York.

31. *DEPRESSARIA EMERITELLA* Stainton.

Depressaria emeritella STAINTON; STAUDINGER and REBEL, Cat. Lep. Eur., II, 1901, No. 3283.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 318.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5261.

Foodplants.—*Tanacetum*, *Artemisia*? (Walsingham.)

The larva is green with dorsal and subdorsal lines darker; head yellowish-green; first thoracic segment black dotted. [Meyrick.]

A good series of European specimens is in the collection of the U. S. National Museum, but I have not met with any from America.

32. *DEPRESSARIA TOGATA* Walsingham.

Depressaria togata WALSINGHAM, Insect Life, I, 1889, p. 254.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5282.

I have identified as this species a large series collected by Dr. W. Barnes, at Glenwood Springs, Colorado, in May, 1895, and specimens from Colorado and Vermont, by Dr. Dyar and others. It was described from Montana.

33. *DEPRESSARIA BETULELLA*, new species.

Antennæ light ochereous, with narrow purplish black annulations, basal joint black. Labial palpi ochereous, second joint on the outside sprinkled with black, terminal joint with base and broad annulation just before tip black; extreme tip ochereous. Face light ochereous; head and thorax darker ochereous, intermixed with brown. Forewings broad and rounded, ochereous, overlaid with fuscous. Base of wing and basal part of costa lighter ochereous, base of dorsal edge nearly white, with a small triangular deep black area above it. First discal spot on middle of disk light ochereous edged anteriorly and posteriorly with black scales; just below it on the fold is a black dot. Second discal spot at the end of the cell larger and somewhat more conspicuous than first, light ochereous, slightly edged with black. At apical third of costa begins a narrow, not very conspicuous, obtusely angulated, light ochereous fascia crossing the wing; it interrupts several narrow black longitudinal streaks which run from the cell nearly to the edge of the wing. Around the entire apical edge from the apical third of costa is a very pronounced row of black dots before the slightly lighter cilia. Hindwings rather dark shining ochereous fuscous, lighter at base; a distinct dark fuscous narrow line runs along the entire edge before the cilia, which is a shade lighter than the wing. On the under side the hindwings are whitish fuscous, sprinkled on the apical half with dark fuscous scales and with an interrupted black line round the edge before the cilia. Abdomen light yellowish fuscous, legs light ochereous,

sprinkled with fuscous; tarsal joints on the outside black, tipped with yellow.

Alar expanse.—23 mm.

Habitat.—Pennsylvania. (W. G. Dietz.)

Type.—No. 6130, U.S.N.M.

Foodplant.—*Betula nigra*.

A very distinct species, belonging to the group with veins 2 and 3 in forewing separate, near *Depressaria nervosa* Haworth, easily separated by the much broader wings and the obtuse fascia.

I am indebted to my friend Dr. Dietz for the finely preserved type which he has bred. A cotype is in his collection. He has kindly sent me the following notes on the larva:

Collected May 24, 1900; larva in silken tube between spun-together leaves of black birch; larva pale green, each segment with two dorsal, one dorso-lateral, and two lateral spots, the latter being placed somewhat obliquely. Moths issued June 27, 1900. [Dietz.]

34. *DEPRESSARIA NERVOSA* Haworth.

Depressaria nervosa HAWORTH; STAUDINGER and REBEL, Cat. Lep. Eur., II, 1901, No. 3306.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 317.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5270.

Foodplant.—*Sium*, *Cicuta*, etc.

The larva is dark bluish-gray, lateral line orange-yellow; spots black, white circled; head black; thoracic plate black, bisected, anterior edge whitish; among spun flowers. Pupa in stem of foodplant. [Meyrick.]

This species, recorded by Lord Walsingham from southern Oregon, I have not seen except in European specimens, a good series of which is in the U. S. National Museum.

35. *DEPRESSARIA BARBERELLA*, new species.

Antennæ dark reddish brown, indistinctly annulated with black, basal joint and pecten black. Labial palpi with large well-developed spreading brush, light ochereous, sprinkled with brown; a spot on the outside of second joint and base of terminal joint black. Face light ochereous; sides of head below and around the eyes deep black, which color continues as a streak on the side of the thorax and outward in a black longitudinal line on the forewing, described below. Top of head and thorax reddish ochereous with posterior tip of thorax black; patagia rich brown streaked with black. Ground color of forewings light ochereous, but so densely dusted with fuscous, reddish and black scales as to appear dark colored to the naked eye. From base, parallel with basal third of costa, is a thin deep black line, mentioned above, edged on both sides with reddish brown. Just before it ends at the costal edge there begins a narrow longitudinal interrupted white line, diverging somewhat from the costa, crossing the costal veins and reaching nearly to the tip of the wing; this line is also edged and

interrupted by reddish brown scales. At base of wing near the dorsal edge is a small black spot, and the fold and veins are indicated by narrow, more or less interrupted, black lines. At the end of the cell is a small round inconspicuous white dot, edged exteriorly with black scales, interiorly with reddish scales. Cilia ochereous fuscous, dusted with red and black scales. Hindwings light ochereous fuscous, whitish toward base, darker fuscous along the edges and at apex. Cilia ochereous fuscous. Abdomen on the upper side ochereous fuscous, on the under side blackish with light ochereous central line. Legs light ochereous on the inside; the outside and the spurs strongly mottled with black; tarsi blackish, each joint tipped with reddish ochereous.

Alar expanse.—28 mm.

Habitat.—Williams, Arizona. (H. S. Barber.)

Type.—No. 6128, U. S. N. M.

This very distinct species is named after the collector, Mr. Herbert S. Barber, who, with Mr. E. A. Schwarz, has added a valuable contribution of *Tineina* from this interesting locality to the National Museum.

Depressaria barberella is by far the largest species of the genus hitherto recorded from America, nearly of the size of the European *D. dictamniella* Treitschke, to which it also comes very near in ornamentation, though easily distinguished from it by the lack of the light-colored costal edge, which contrasts strongly with the dark area below it in *D. dictamniella*.

36. *DEPRESSARIA HERACLIANA* De Geer.

Depressaria heracliana DE GEER; STAUDINGER and REBEL, Cat. Lep. Eur., II, 1901, No. 3280.—LINTNER, Can. Ent., V, 1873, p. 82.—ZELLER, Verh. Zool. Bot. Ges. Wien., 1873, p. 235.—CHAMBERS, Bull. U. S. Geol. Surv. Terr., IV, 1878, p. 138.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 312.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5265.—DIETZ, Smith's List Ins. N. J., 1900, p. 474.

Depressaria ontariella BETHUNE, Can. Ent., II, 1869, pp. 3 and 19.—CHAMBERS, Can. Ent., IV, 1872, p. 9.

Foodplant.—*Heracleum*, *Pastinaca*, etc.

The larva is gray, on sides dull yellow, spots black; head and thoracic plate black. [Meyrick].

Besides European specimens the U. S. National Museum possesses a series from America including larvae.

37. *DEPRESSARIA GROTELLA* Robinson.

Depressaria grotella ROBINSON, Ann. Lye. Nat. Hist. N. Y., IX, 1870, p. 157, pl. 1, fig. 10.—CHAMBERS, Bull. U. S. Geol. Surv. Terr., IV, 1875, p. 138.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 312.—COQUILLETT, Papilio, III, 1883, p. 98.—RILEY, Smith's List Lep. Bor. Am., 1901, No. 5264.

Foodplant.—*Corylus americana*.

The larva is green, darkest dorsally; cervical shield green, unmarked; head green, with a black dot on each side above the jaws [Coquillett].

This species is unknown to me except from the description. It can not from this alone be properly placed with certainty, and it is possible that it belongs in the group with veins 2 and 3 stalked in forewing. From the figure and description it looks to be very close to *heracliana*, and I have therefore placed it so.

38. *DEPRESSARIA CINERECOSTELLA* Clemens.

Depressaria cinereocostella CLEMENS, Proc. Ent. Soc. Phila., 1863, p. 125.—ROBINSON, Ann. Lyc. Nat. Hist. N. Y., IX, 1870, p. 155, pl. 1, fig. 6.—CLEMENS, Stainton's Tin. Nor. Am., 1872, p. 245.—CHAMBERS, Bull. U. S. Geol. Surv. Terr., IV, 1878, p. 138.—WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 312.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5258.

Foodplant.—*Sium lineare*.

This fine little species, which is very distinct from all other described American species, but which resembles the European *Depressaria absynthiella* Herrich-Schäffer,¹ I have bred from water parsnip growing on the Virginia side of the Potomac just above Washington. The larva is light sulphur yellow, strikingly marked by the small but intensely black, shining tubercles, which emit short black hairs. The head is rather dark ochereous, shining, with black eyespots; thoracic shield paler ochereous.

The larva folds and ties together the leaves and pupates among rubbish on the ground. Nearly full-grown larvæ were found early in July and the imago issued by the end of the same month. A bred series and blown larvæ are in the U. S. National Museum.

39. *DEPRESSARIA SCABELLA* Zeller.

Depressaria scabella ZELLER, Verh. Zool. Bot. Ges. Wien., XXIII, 1873, p. 236.—CHAMBERS, Bull. U. S. Geol. Surv. Terr., IV, 1878, p. 138.—RILEY, Smith's List Lep. Bor. Am., 1891, No. 5280.

Depressaria scabrella WALSINGHAM, Proc. Zool. Soc. Lond., 1881, p. 312.

This species is unknown to the writer except from the description, which seems to indicate that it is not a true *Depressaria*. The nearly smooth labial palpi and the raised scales on the forewing are, as mentioned by Zeller, unusual to the genus. It was described from Ohio; the type is in the British Museum.

¹Staudinger and Rebel, Cat. Lep. Eur., II, 1901, No. 3292.

THE MAMMALS OF THE ANDAMAN AND NICOBAR ISLANDS.

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INTRODUCTION.

The months of January, February, and March, 1901, were spent by Dr. W. L. Abbott and Mr. C. B. Kloss in exploring the Andaman and Nicobar Islands. Valuable collections were made in several branches of zoology and in anthropology, all of which have been presented to the United States National Museum. This paper contains an account of the mammals, of which 170 specimens were secured, chiefly by Dr. Abbott, Mr. Kloss having turned his attention more particularly to the birds.

Leaving Victoria Point on December 26, 1900, Dr. Abbott and Mr. Kloss proceeded first to the Andamans, where they touched successively at Barren Island, Henry Lawrence Island, South Andaman Island, North Cinque Island, and Little Andaman Island. Thence they sailed to the Nicobars, visiting Car Nicobar, Tillanchong Island, Trinkut Island, Kamorta Island, Kachal Island, Nankauri Island, Little Nicobar Island, and Great Nicobar Island.

Except on North Cinque Island, mammals were obtained at every locality visited. These represent such a large part of the fauna hitherto known, and, moreover, so many species not before detected, that I have extended the scope of this paper to include all of the mammals recorded from the Andaman and Nicobar islands. A discussion of their mutual relationships and probable origin is given in the summary following the systematic list of species.

Only one general account of the mammals of the Andaman and Nicobar Islands has hitherto been published. This was by Blyth, and it formed part of the appendix to Mouat's *Adventures and Researches among the Andaman Islanders* (1863). The remainder of the literature of the subject is so scattered that it is almost impossible to bring it completely together. The bibliography at the end of the present

article, however, probably contains the titles of all the more important papers on the subject.

The Andaman and Nicobar islands, an outline map of which is given in the accompanying figure, lie in the eastern side of the Bay of Bengal. They form an almost continuous chain from off the southern coast of Pegu nearly to the northern extremity of Sumatra and parallel with the northern portion of the Malay Peninsula. For the most part they are densely forested, and the climate, though tropical, is not of the hottest. From the nearest land, as well as from each other, both Andamans and Nicobars are separated by water of very considerable depth. In this respect they differ widely from the other islands in the neighborhood of the Malay Peninsula.

SYSTEMATIC LIST OF SPECIES.

Genus DUGONG Lacépède.

DUGONG DUGON (Müller).

1859. *Halicore indicus* BLYTH, Journ. Asiat. Soc. Bengal, XXVIII, p. 271. (Andamans.)

Bones of the dugong have been found in the huts of the native Andamanese.

Genus SUS Linnæus.

SUS ANDAMANENSIS Blyth.

1858. *Sus andamanensis* BLYTH, Journ. Asiat. Soc. Bengal, XXVII, p. 267. (Port Blair, South Andaman Island.)

The pig appears to have been the first of the Andaman mammals to attract the attention of explorers. In 1827 J. E. Alexander published a notice regarding the little Andaman Island, Bay of Bengal,¹ in which he says:

Ranged in a row around the walls (of a native hut) were the smoked skulls of a diminutive hog, the canine teeth shorter than in other species of *sus* in eastern countries, the jaws fastened together by strips of rattan (Pl. I, fig. 1).

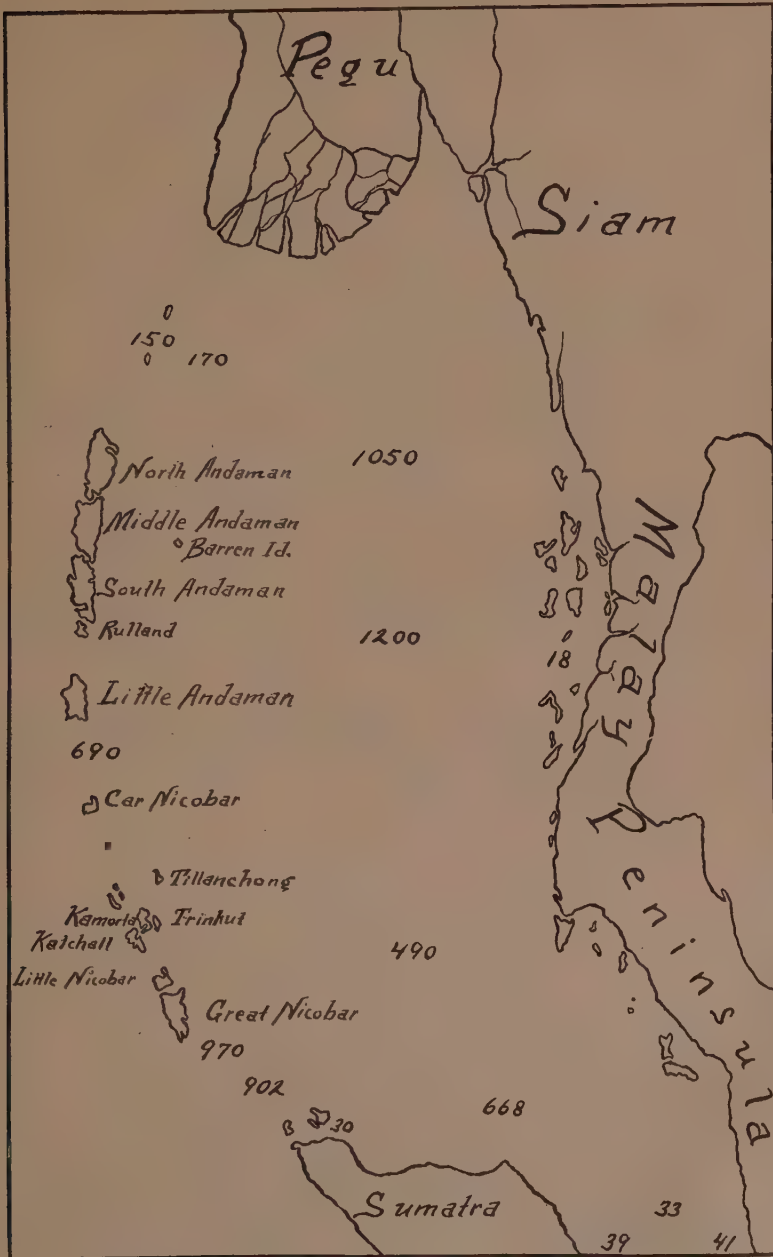
The figure is quite unrecognizable beyond the fact that it was evidently intended to represent the skull of a pig, but the description leaves no doubt as to the identity of the animal. Thirty-one years later the animal was described by Blyth as *Sus andamanensis*² from skulls collected at Port Blair, South Andaman Island. In a subsequent account of collections from Port Blair,³ Blyth adds a few words concerning its external appearance, erroneously stating that the tail is reduced to a mere tubercle. A year later,⁴ however, he recognizes

¹ Edinburgh New Philos. Journ., II (October-December, 1826), 1827, pp. 43-48, pl. I.

² Journ. Asiat. Soc. Bengal, XXVII, 1858, p. 267.

³ Idem, XXVIII, 1859, p. 271.

⁴ Idem, XXIX, 1860, p. 104.



Outline map of the Andaman and Nicobar islands, and neighboring regions.

that this was due to the imperfect condition of his specimen. In the appendix to Mouat's Adventures and Researches among the Andaman Islanders, published in 1863, Blyth adds nothing to what he had previously written, beyond the remark that the animal apparently inhabits the Nicobars and Sumatra as well as the Andamans, and that a full grown female was then living in the London Zoological Garden. It is now known that the native pig of the Nicobars is distinct from that of the Andamans, and there is little reason to suppose that either species occurs in Sumatra.

Little has been added to the accounts of the Andaman pig given by Blyth. Gray recorded two skulls in the British Museum in 1869,¹ and also remarks that a female, probably the one mentioned by Blyth, and her hybrid offspring by a male wild pig from Dampier Straits are in the Society's gardens. Both of the skulls examined by Gray appear to have been those of very old individuals, with much-worn teeth. They showed peculiarities that suggested relationship with *Babirussa*, but in this respect were probably abnormal. Apparently based on the same unsatisfactory material is Dobson's short description.² It contains the erroneous statements that the tail is very short and that the molars are much less complex than in *Sus cristatus*.

Dr. Abbott shot an adult male in the forest at Bumila Creek, Little Andaman, January 20, 1901. At this locality the animals appeared to be abundant, though no special observations were made concerning their habits.

The external measurements of this specimen are as follows: Head and body, 1,030 mm.; tail, 200; height at shoulder, 500; height at rump, 520; depth of chest, 290; girth of chest, 810; girth of belly, 1,040. Weight (estimated), 34 kg.

Except for its darker color and more scant covering of hair, this pig is externally a miniature *Sus cristatus*. In proportion it agrees perfectly with the large animal of Tenasserim and Lower Siam. The tail, as in the latter, is as long as the hind foot. The crest and mane are, relatively to the general character of the hair, nearly as well developed as in *Sus cristatus*, though actually they are shorter. On the entire animal, the region occupied by the mane and crest excepted, the bristles are so sparse that the skin is plainly visible, while the legs, face, cheeks, and ears are practically naked. The hairs on the under parts are likewise less numerous than in the mainland animal, but there is nothing peculiar about the hairy coating of the tail. As in *Sus cristatus*, the tail is essentially naked, except that the terminal 50 mm. of its length is provided with a flattened brush of rather soft bristles 50-80 mm. long. In color *Sus andamanensis* differs considerably from *S. cristatus*. The bristles are everywhere clear glossy

¹ Catal. Carniv. Pachyderm. and Edentate Mamm. Brit. Mus., pp. 336-337.

² The Fauna of British India, Mamm., 1891, pp. 562-563.

black, in certain lights showing faint brownish tips, which become noticeable on the mane and crest only. The caudal tuft is also tinged with brown. As there is essentially no hair in the region it would occupy, the light malar streak of *S. cristatus* is absent.

Aside from its strikingly smaller size the skull of *Sus andamanensis* shows no distinct character to separate it from that of *S. cristatus*. The teeth of the one specimen secured by Dr. Abbott are so worn that the enamel pattern is largely obliterated, but that which remains shows no indication of less complexity than in *Sus cristatus*. The length of the hinder molar, both above and below, is equal to that of the two preceding teeth together. The cranial measurements of this specimen, together with those of a young adult skull of *Sus cristatus* from Tanjong Badak, Tenasserim, the latter in parenthesis, are as follows:

Occipito-nasal length (median), 256 (370) mm.; basal length, 220 (320); basilar length, 215 (310); length of nasals, 123 (185); width of both nasals together posteriorly, 25 (40); median length of bony palate, 153 (220); width of bony palate at middle of second molar, 27 (38); distance between tips of postorbital processes, 81 (111); least interorbital breadth, 55 (85); zygomatic breadth, 114 (148); occipital breadth, 52 (76); occipital depth, 95 (130); least depth of rostrum between canine and incisor, 29 (46); mandible, 190 (270); depth of mandible through coronoid process, 90 (120); depth of ramus at front of first molar, 36 (47); maxillary toothrow to front of canine (alveoli), 107 (154); mandibular toothrow to front of canine (alveoli), 117 (166); crown of first upper molar, 10 by 14 (17 by 15); crown of second upper molar, 17 by 14 (23 by 19); crown of third upper molar, 25 by 16 (37 by 21); crown of first lower molar, 13 by 10 (16.4 by 11); crown of second lower molar, 16 by 14 (21.6 by 15); crown of third lower molar, 27 by 13.6 (40 by 17).

SUS NICOBARICUS, new species.

Type.—Young adult male (skin and skull), No. 111794, U.S.N.M. Collected on Great Nicobar Island, Nicobars, March 13, 1901, by Dr. W. L. Abbott. Original number, 930.

Characters.—Like *Sus andamanensis*, but slightly larger, and with much larger teeth. Color entirely black. Tail covered with a sparse, nearly uniform growth of long black hairs.

Fur.—The fur throughout consists of bristles with no admixture of softer hairs. In texture it resembles that of *Sus andamanensis*, and is much less harsh than that of *Sus cristatus*. The diameter of the individual bristles of both back and mane is scarcely more than half that of hairs from corresponding regions in the mainland animal, and is apparently a little less than in the Andaman pig. Mane and dorsal crest well developed, though less so than in *Sus cristatus*. At middle of back the bristles of the crest are about 70 mm. in length, while

those bordering it barely reach a length of 50 mm. The crest, however, owes its distinctness to the greater crowding of the bristles of which it is composed, as compared with those of the surrounding parts. As in *Sus andamanensis*, the skin is plainly visible through its scant covering of hair everywhere except in the region occupied by the mane and crest. The cheeks are more hairy than in *Sus andamanensis*. The tail is hairy throughout except at tip. At base the hairs, which are much softer than the bristles of the back, are rather inconspicuous, but near middle they increase in number and in length, and form a straggling brush, the longest hairs of which are 150 mm. long.

Color.—The color is black throughout, with a faint brownish wash on dorsal crest. Hoofs rather dark horn color. In the type the hind feet are albinistic between hoof and hock, the light color involving the hoofs as well as the hair.

Skull.—The skull of *Sus nicobaricus*, though distinctly larger than that of *S. andamanensis*, shows no approach to the dimensions of that of *S. cristatus*. In form it differs from the skull of *Sus andamanensis* chiefly in the greater angle formed by the surface of the forehead with that of the rostrum, and in the larger, more inflated audital bullæ. The zygomatic arch as a whole is more heavily built than in *Sus andamanensis*, and its horizontal surface is broader posteriorly.

As compared with the skull of *Sus cristatus* from Tenasserim, that of *S. nicobaricus* shows numerous differences in form. Most conspicuous among these are the relatively shorter rostrum and the very distinct angle in the facial profile at posterior extremity of nasals. This angle is difficult to measure, but it is approximately 8° in *Sus cristatus*, and 18° in *S. nicobaricus*. The audital bullæ appear to be relatively larger than in the average of *Sus cristatus*, but this character is probably not constant.

Teeth.—The teeth are slightly larger in proportion to the size of the skull than in *Sus andamanensis*, but otherwise I can detect no differences. They also agree in all essential characters with those of *Sus cristatus*.

Measurements.—External measurements of type: Total length, 1,190 mm.; head and body, 1,000; tail, 190; height at shoulder, 520; hind foot (hoof included), 185.

Cranial measurements of adult male considerably older than type (No. 112011, U.S.N.M.): Occipito-nasal length, 280 (256) mm.;¹ basal length, 255 (220); basilar length, 245 (215); length of nasals, 133 (123); width of both nasals together posteriorly, 40 (25); median length of bony palate, 175 (153); width of bony palate at middle of second molar, 31 (27); distance between tips of postorbital processes, 92 (81); least

¹ Measurements in parenthesis are those of the slightly older specimen of *Sus andamanensis*.

interorbital breadth, 71 (55); zygomatic breadth, 130 (114); occipital breadth, 57 (52); occipital depth, 105 (95); least depth of rostrum between canine and incisor, 35 (29); mandible, 220 (190); depth of mandible through coronoid process, 105 (90); depth of ramus at front of first molar, 32 (36); maxillary tooththrow to front of canine (alveoli), 118 (107); mandibular tooththrow to front of canine (alveoli), 132 (117); crown of first upper molar, 12 by 14 (10 by 14); crown of second upper molar, 17 by 17 (17 by 14); crown of third upper molar, 26 by 18 (25 by 16); crown of first lower molar, — (13 by 10); crown of second lower molar, 16 by 14 (16 by 14); crown of third lower molar, 30 by 15 (27 by 13.6).

Remarks.—This species is readily distinguishable from the Andaman pig by its larger teeth. The uniform black color of the type and the peculiar hairing of the tail may be mere individual characters.

The occurrence of a diminutive wild pig on the Nicobar Islands was noted as long ago as 1863 by Blyth;¹ but until the present time there has been no opportunity to compare the animal with *Sus andamanensis*. That it proves to be distinct from the Andaman swine is not in the least surprising, though such a possibility appears not to have occurred to Blyth. He says:

The small Andamanese wild pig appears, at first, to be as isolated in its range as new to science; but I have been assured of the existence of a diminutive wild pig in the Nicobars, additional to the huge tame swine of undoubtedly exotic origin, which are bred by the Nicobarians of the coasts; and I have also considerable reason to suspect that it exists likewise in Sumatra.

The differences between the wild and domesticated pigs of the Andamans alluded to by Blyth were noted in considerable detail by Dr. Abbott.²

Pigs, both tame and wild [he writes] were plentiful in the Nicobars. Those in Kar Nicobar, and many of the tame ones everywhere, are descendants of European and Chinese stock, and splendid big porkers some of them are. But the wild pig of which I send you one skin and two skulls from Great Nicobar does not seem the same. It is small, about the same size as that of Bunguran Island [*Sus natunensis*], the males weighing about 90 pounds. I am almost sure that it has been introduced long ago into the Nicobars, and that it was originally *Sus cristatus* of the mainland, degenerating as the result of insularity and inbreeding. The Danes and others have had settlements on the Nicobars in the last century, and an extensive trade with India and with Chinese junks from Hainan. This trade has been going on for generations, and the modern big pig is the result of the new introductions mixed more or less with the small form. In Great and Little Nicobar many of the tame pigs are precisely like the skin of the wild one which I send, and although the tame animals are usually larger they never equal the size of the huge European pigs of Kar Nicobar and the islands of the central group.

¹ Appendix to Mouat's *Adventures and Researches among the Andaman Islanders*, p. 349.

² Letter dated April 23, 1901.

MUS MUSCULUS Linnæus.

1859. *Mus manei* BLYTH, Journ. Asiat. Soc. Bengal, XXVIII, p. 271.

The house mouse was recorded from the Andamans by Blyth. The specimens to which he referred were taken at Port Blair. The animal is apparently unknown in the Nicobars.

MUS PALMARUM Zelebor.

1861. *Mus palmarum* (adult) and *Mus novaræ* (immature) FITZINGER, Sitzungsber. Math.—Naturwissensch. Cl. Kais. Akad. Wissensch., Wien, XLII (1860), pp. 385, 394. 1861. (*Nomina nuda.*)

1869. *Mus palmarum* ZELEBOR, Reise der österreichischen Fregatte Novara, Zool., I (Wirbelthiere), 1, Mamm., p. 26. (Nicobar Islands.)

The very clear and detailed description of this rat leaves no doubt that the animal is distinct from *Mus rattus* and somewhat closely allied to the large *Mus stoicus* and *Mus taciturnus* of the Andamans. Its dimensions alone are sufficient to separate it from the black rat and allied forms. Some of the measurements are as follows: Head and body, 275 mm.; tail, 215; hind foot, 50; greatest length of skull, 54; greatest breadth of skull, 25. In the members of the group to which the black rat belongs the hind foot seldom reaches a length of 40 mm., and the greatest length of skull is rarely over 45 mm. The pattern of enamel folding in the molar teeth of *Mus palmarum* apparently differs in several important particulars from that of *Mus rattus* and its allies; but the animals are too distinct to require detailed comparison.

The palm rat is said by Zelebor to be not uncommon in the Nicobar Islands, where it occurs mostly in the crowns of the palms, leaping from tree to tree with much agility. It was not met with by Dr. Abbott.

MUS STOICUS, new species.

Type.—Adult male (skin and skull) No. 111834, U.S.N.M. Collected on Henry Lawrence Island, Andamans, January 9, 1901, by Dr. W. L. Abbott. Original number, 820.

Characters.—A large, heavily built rat, bearing a general likeness to *Mus validus* and *Mus palmarum*. Tail considerably shorter than head and body, unicolor. Fur of back moderately spinous. Underparts bluish gray. Mammæ apparently ten. Skull as long as that of *Mus validus*, but very slender. Teeth with normal enamel pattern, the length of upper molar series (alveoli) in adults less than half diastema.

Fur.—Underfur rather scant, much less dense than in *Mus validus* or *Mus norvegicus*, but not peculiar in quality; it is most abundant on flanks and lumbar region. Main body of fur composed of two elements, soft terete hairs and stiff grooved bristles. On middle of back these are about 15 mm. in length, but the hairs usually a little exceed the bristles. Width of bristles on back about .33 mm. On underparts they become much more slender and are scarcely to be distin-

guished from the terete hairs. The bristles are numerous on middle of back and on sides, but are practically absent from rump and from region in front of shoulders. The back is rather plentifully sprinkled with coarse terete hairs about 50 mm. in length, but these are not sufficiently numerous to influence the general appearance of the fur. Whiskers coarse, the longest 70 mm. in length. Supraorbital bristle about 10 mm. less.

Color.—Back a coarse grizzle of black and dull ochraceous buff (distinctly darker than Ridgway's Pl. v, fig. 10) the latter element in excess. The effect is similar to the general color of *Mus validus* but considerably more yellow. The longer hairs are strongly lustrous, so that in certain lights the fur has a noticeable steely gloss. This sheen is very conspicuous at sides of shoulders when the skin is viewed from in front. Sides like back but with buff even more predominant. Underparts and inner surface of limbs nearly uniform mouse gray (paler than that of Ridgway). This color is due to the combined effect of the drab underfur and whitish hair tips. It extends entirely around upper lip and spreads over cheeks, where, however, it becomes mixed with ochraceous buff. Eye surrounded by a very faintly indicated dark ring. Whiskers black. Ears and tail uniform dull dark brown throughout. Feet sprinkled with fine whitish hairs, these nowhere abundant enough to conceal the light brown skin.

Tail.—The tail is rather inconspicuously annulated—that is, the boundaries of the scales are less sharply defined than in most rats of the same size. At middle there are about 10 rings to the centimeter. At first sight the tail appears to be naked, but on close inspection it is seen to be beset with fine appressed hairs 1 to 2 mm. in length, two or three of which spring from the base of each scale.

Mammæ.—In the single adult female collected one pectoral and three inguinal mammæ are plainly visible on each side. The skin is in bad condition in the region which the anterior pair of pectoral mammæ would occupy if present. On the label Dr. Abbott has written "mammæ apparently ten."

Feet.—The feet show no peculiarities of form or structure. Soles naked, with six well-developed tubercles.

Ears.—The ears are moderately large, their height from crown exactly equal to distance between eye and tip of muzzle. In form they are not peculiar. Both surfaces are naked except for a fine, close pubescence.

Skull.—The skull of *Mus stoicus* differs conspicuously from that of *Mus validus*, *Mus vociferans*, or *Mus boursieri* in its much lighter structure and more slender form. Viewed from above it does not differ widely from the skull of *Mus vociferans*, except that it is more narrow throughout, a difference more noticeable in rostrum and braincase than in the zygomatic region. Supraorbital ridges about as in *Mus vociferans*. The plate of the maxillary forming outer wall of

antorbital foramen is as broad as in *Mus validus*, but the foramen is widely open below, as in *Mus vociferans*. These characters are very apparent in this view of the skull. Viewed from the side the skull closely resembles that of *Mus vociferans*, except for the peculiarities already mentioned. Zygomata much more slender than in the allied species. Viewed from beneath the skull shows its most striking characters. The floor of the braincase is essentially like that of *Mus vociferans*, though the audital bullæ are distinctly larger than in the mainland animal. In form the bullæ do not differ very materially from those of *Mus vociferans*, though they are somewhat more inflated anteriorly. Palate and rostrum very unlike those of any of the allied species, the differences due to the combined reduction in size of the teeth and elongation of rostrum. The length of toothrow is contained fully twice in length of diastema, instead of about once and a half, as in *Mus vociferans* and *Mus validus*. The incisive foramina share in the elongation of the rostrum to such an extent that they are much longer than the toothrow instead of distinctly shorter. Except that it shares in the general slender form of the skull the mandible shows no characters of importance.

Teeth.—The teeth differ from those of *Mus vociferans* in size only, as the enamel pattern of the two species is similar throughout.

Measurements.—External measurements of type: Total length, 442 mm.; head and body, 249; tail, 193; hind foot, 47 (45); ear from meatus, 24; ear from crown, 20; width of ear, 16. Average of ten adults from the type locality: Total length, 437 (415–465); head and body, 241 (220–260); tail, 198 (192–212); hind foot, 48 (47–50); hind foot without claws, 46 (45–48). For detailed measurements see table, page 764.

Cranial measurements of largest specimen: Greatest length, 55.4 mm. (56);¹ basal length, 50 (47.6); basilar length, 47 (44.6); palatal length, 28 (25); least width of palate between anterior molars, 6 (5); diastema, 18 (14.8); length of incisive foramen, 10.6 (8); combined breadth of incisive foramina, 3.8 (3.8); length of nasals, 22 (21.4); combined breadth of nasals, 5.4 (6.2); zygomatic breadth, 25 (25.8); interorbital breadth, 9 (9); breadth of braincase above roots of zygomata, 18 (20.4); mastoid breadth, 19 (18.8); occipital depth at front of basioccipital, 14.6 (14); frontopalatal depth at posterior extremity of nasals, 13 (13.6); least depth of rostrum immediately behind incisors, 9.8 (11); mandible, 31 (30.6); maxillary toothrow (alveoli), 8.2 (11.8); width of front upper molar, 2.4 (3); mandibular toothrow (alveoli), 8.4 (10).

Specimens examined.—Eighteen, all from the type locality.

Remarks.—In general appearance *Mus stoicus* resembles *Mus validus*, but the skull is much more slender. It is, however, in no way distantly related to the large rats of the Malay Peninsula.

¹ Measurements in parenthesis are those of the type of *Mus vociferans*.

Dr. Abbott writes as follows of the rats of Henry Lawrence Island (*Mus stoicus* and *Mus flebilis*):

Trapped in the dense jungle with which the island is covered. Note that in this lot there are two distinct species; one large with tail shorter than head and body [*M. stoicus*], and one smaller with tail longer than head and body [*M. flebilis*]. The tail is more hairy in the smaller species. Both were caught in the same places, on the west side of the island on Kwantung Straits, at two localities about two miles apart. The smaller one squeals piteously when caught in a trap, but the larger is silent.

MUS TACITURNUS, new species.

Type.—Adult male (skin and skull), No. 111828, U.S.N.M. Collected on South Andaman Island, Andamans, January 16, 1901, by Dr. W. L. Abbott. Original number, 854.

Characters.—Slightly larger than *Mus stoicus*, and color both above and below more tinged with yellow.

Color.—Back and sides a coarse grizzle of black and bright ochraceous buff (distinctly more yellow than Ridgway's, Pl. v, fig. 10), the latter very conspicuously in excess. Underparts paler than in *Mus stoicus*, though the elements of the color are essentially the same, the difference due to the more extensive whitish hair tips, and faintly lighter under fur. Color otherwise as in *Mus stoicus*.

Measurements.—External measurements of type: Total length, 494 mm.; head and body, 266; tail, 228; hind foot, 53 (50); ear from meatus, 24; ear from crown, 21; width of ear, 16.4. An adult female measures: Total length, 446; head and body, 237; tail, 209; hind foot, 48 (46). For detailed measurements see table, page 764.

Specimens examined.—Seven, all from the type locality.

Remarks.—This species is very closely allied to *Mus stoicus*, but is nevertheless easily distinguishable on comparison. It is probably the rat recorded by Blanford as "a variety of *Mus bowersi* or a closely allied form."¹ *Mus bowersi* differs, however, from all of the rats known to occur on the Andamans by its distinctly bicolored tail.

MUS FLEBILIS, new species.

Type.—Adult female (skin and skull), No. 111841, U.S.N.M. Collected on Henry Lawrence Island, Andamans, January 10, 1901, by Dr. W. L. Abbott. Original number, 827.

Characters.—A large member of the *Mus rattus* group. Size about as in *Mus pannosus* of the Butang Islands, but tail always considerably longer than head and body. Fur thickly sprinkled with weak spines, its color paler and more yellow than in *Mus pannosus* and closely resembling that of *Mus stoicus*. Skull much like that of *Mus pannosus*, but with larger audital bullae, more prominent supraorbital ridges, and smaller teeth.

¹ The Fauna of British India, Mamm., 1891, p. 410.

Fur.—The fur is like that of *Mus stoicus*, except that the bristles are a little less stiff and the under fur is somewhat more woolly. The long terete hairs on the back are less noticeable than in the larger animal. In abundance and distribution the bristles are essentially the same in the two species.

Color.—Back and sides essentially as in *Mus stoicus*, except that the light element of the grizzle is paler, almost exactly matching the ochraceous buff of Ridgway, and a little more noticeably in excess of the dark. The fur is nearly destitute of the lustrous sheen so noticeable in the larger animal. Muzzle and outer surface of front legs washed with broccoli-brown. Under parts and inner surface of limbs cream buff. Under fur light drab. Ears and tail dull brown throughout. The color of the under parts completely encircles the mouth, but scarcely spreads upward on cheeks. Feet more thickly haired than in *Mus stoicus*, cream buff heavily clouded with drab. Whiskers black. A faintly indicated dark eye-ring.

Tail.—The annulation of the tail is similar to that in *Mus stoicus*, except that the rings and scales are more sharply defined. At middle there are 10 rings to the centimeter. The hairs, though not conspicuous, are longer and more abundant than in the larger animal.

Mammæ.—There are 10 mammæ, 2 pectoral and 3 inguinal on each side.

Feet.—The feet are in no way peculiar. Soles naked, with 6 well-developed tubercles.

Ears.—The ears are essentially as in *Mus stoicus*.

Skull.—The skull of *Mus flebilis* resembles that of the larger members of the *Mus rattus* group, but is readily distinguishable by its larger audital bullæ and more strongly developed supraorbital ridges. In the latter character it suggests *Mus surifer* and its allies. As compared with the skull of *Mus pannosus* that of *Mus flebilis* differs, aside from the characters just mentioned, in slightly smaller size, relatively shorter, more robust rostrum, narrower outer wall of antorbital foramen, more abruptly flaring zygomatica, and longer incisive foramina. The mandible is essentially the same in both species. Its much greater size (greatest length about 45 mm. instead of about 40) immediately distinguishes the skull of *Mus flebilis* from that of *Mus rattus* and *Mus alexandrinus*.

Teeth.—The teeth exactly resemble those of *Mus alexandrinus* and *Mus rattus* in form and in pattern of enamel folding, but are conspicuously larger. In the latter character they are slightly surpassed by those of *Mus pannosus*.

Measurements.—External measurements of type: Total length, 452 mm.; head and body, 210; tail, 242; hindfoot, 41.4 (39); ear from meatus, 21; ear from crown, 16; width of ear, 15. Average of 6 adults from the type locality: Total length, 441 (417–460); head and

body, 203 (193-210); tail, 238 (222-240); hindfoot, 41.8 (41-44); hindfoot without claws, 40 (39-42). For detailed measurements see table below.

Cranial measurements of type: Greatest length, 45 (47.6)¹ mm.; basal length, 40 (41); basilar length, 37 (37.6); palatal length, 21.4 (22); least width of palate between anterior molars, 5 (5); diastema, 13 (13); length of incisive foramen, 8.8 (8); combined breadth of incisive foramina, 3 (4); length of nasals, 18 (18); combined breadth of nasals, 4.8 (5.4); zygomatic breadth, 19.8 (22); interorbital breadth, 6 (7); mastoid breadth, 18 (18); breadth of braincase above roots of zygomata, 16 (16.4); depth of braincase at anterior border of basioccipital, 11.4 (12); fronto-palatal depth at posterior extremity of nasals, 11 (11.4); least depth of rostrum immediately behind incisors, 8.6 (9); mandible, 26 (27.6); maxillary toothrow (alveoli), 7.4 (8); width of front upper molar, 2.2 (2.6); mandibular toothrow (alveoli), 7.4 (7.8).

Specimens examined.—Seven, all from the type locality.

Remarks.—These rats were trapped, together with the specimens of *Mus stoicus*, in the dense jungle with which Henry Lawrence Island is covered. The types of both species were taken on the south side of the island on the shore of Kwantung Straits. Other specimens were secured at a point about 2 miles farther north. The names which I have used for the two species were suggested by Dr. Abbott's note that the smaller animal squeals piteously when caught, while the larger is silent.

Table of measurements of *Mus stoicus*, *Mus taciturnus*, and *Mus flebilis*.

Name.	Number.	Sex.	Total length.	Head and body.	Tail.	Hind foot.	Hind foot without claws.
			<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i>
<i>Mus stoicus</i>	² 11834	Male	442	249	193	47	45
Do.	11835	do	415	240	175	47.6	45
Do.	11836	do	425	246	180	49	47
Do.	11838	do	403	223	180	46	44
Do.	11839	do	425	233	192	48.6	46
Do.	11842	do	410	222	188	48	45
Do.	11845	do	465	260	205	49	47
Do.	11846	do	450	252	198	47.6	45
Do.	11847	do	442	242	200	46.4	44
Do.	11848	Female	452	240	212	48	46
Do.	11849	Male	422	220	180	45.6	43
Do.	11850	do	440	237	203	48	45.6
Do.	11851	do	415	218	197	48.6	46
Do.	11853	Female	422	200	180	41.4	39.6
Do.	11856	Male	422	222	200	48	45.6
<i>Mus taciturnus</i>	11818	do	432	242	190	48	46
Do.	11820	do	397	200	197	45	44
Do.	11822	Female	330	230	200	44	43
Do.	² 11828	Male	494	266	228	53	50
Do.	11831	Female	429	216	213	48	46
Do.	11832	do	446	237	209	47.6	45.6
Do.	11833	do	414	224	190	44	42
<i>Mus flebilis</i>	11837	Male	447	210	237	44	42
Do.	11840	do	417	195	222	42	41
Do.	² 11841	Female	452	210	242	41.4	39
Do.	11843	do	460	207	253	31.4	39.6
Do.	11852	do	428	193	235	41	39
Do.	11854	Male	442	202	240	41.6	40

¹ Measurements in parenthesis are those of the type of *Mus pannosus*.

² Type.

MUS ANDAMANENSIS Blyth.

Mus (*Leggada*?) *andamansis* BLYTH, Journ. Asiat. Soc. Bengal, XXIX, 1860, p. 103. (Port Blair, South Andaman Island.)

Blyth first mentioned the Andaman rat in 1859¹ as a species "not of recent introduction," to the islands. The following year specimens taken by Captain Hodge, then in command of the guard ship *Sesostris* at Port Blair, enabled him to name and describe the animal. Though occasionally alluded to during the course of the next few years² *Mus andamanensis* has remained a very imperfectly known animal, and since 1891³ has been generally regarded as identical with *Mus rattus*.

Dr. Abbott secured eight specimens at MacPherson Strait, South Andaman Island. These show that the species is quite distinct from *Mus rattus*, *Mus alexandrinus*, or any other known rat. It may be characterized as follows:

In size and external appearance much like the form of *Mus alexandrinus*, occurring in Trong, Lower Siam, and on Nankauri Island, Nicobars, but fur often, though not invariably, more spinous, and light color (pale cream buff) of under parts sharply contrasted with brown of sides. Tail slightly longer than head and body. Skull similar to that of *Mus alexandrinus*, but *teeth noticeably larger*.

There is considerable variation in the quality of the fur. In six of the specimens the spines are larger and much more conspicuous than in *Mus alexandrinus*, but in the others they are exactly as in the mainland animal. Color as in Malayan *Mus alexandrinus*, except that there is a distinct line of demarcation between the pale cream buff of the belly and the yellowish brown of the sides. As shown by the table of measurements (page 772), the tail is usually a little longer than the head and body. The single exception (No. 111823) is so striking that the specimen suggests at first sight a distinct species; but in all characters, except the greatly elongated tail, it agrees with the others from the same locality.

MUS PULLIVENTER, new species.

Type.—Adult male (skin and skull), No. 111790, U.S.N.M. Collected on Great Nicobar Island, Nicobars, March 12, 1901, by Dr. W. L. Abbott. Original number, 927.

Characters.—A rat of somewhat less bulk than *Mus flebilis*, but with smaller hind foot and shorter tail, the length of latter considerably less than that of head and body. Fur densely spinous, but the bristles even more slender than in *Mus flebilis*. Color brown throughout, the belly not distinctly paler than sides, skull slender, with dorsal profile

¹Journ. Asiat. Soc. Bengal, XXVIII, p. 27.

²Blyth, Appendix to Mouat's Adventures and Researches among the Andaman Islanders, 1863, p. 354.

³Blanford, The Fauna of British India, Mamm., p. 406.

nearly straight from middle of brain case to tip of nasals. Teeth small, normal. Mammæ 8.

Fur.—The fur is fine and close in texture, but on examination it is seen to be densely beset with very slender spines. These spines are rather more numerous than in *Mus flebilis*, but their width is distinctly less than in the Andaman species. The fur of the back is sprinkled with a few long terete hairs, but these are only evident on close inspection. On the belly the bristles are reduced to mere rudiments scarcely to be distinguished from the ordinary hairs.

Color.—Back and sides a fine grizzle of black and russet, the two colors in about equal parts on the back, the russet in excess on the sides and outer surface of legs, where it is faintly washed with wood brown. Belly and inner side of legs drab, a little tinged with russet. Chin, middle of throat, axillary region and area surrounding nipples white, this color perhaps abnormal. Cheeks and muzzle like belly, but slightly more washed with russet. Top of head dark, grizzled hair brown. Feet scantily sprinkled with brownish and whitish hairs. Ears and tail uniform dark brown.

Tail.—The annulation of the tail is indistinct and somewhat irregular. At middle there are eleven or twelve rings to the centimeter. From the base of each scale spring two or three stiff hairs, the length of which scarcely exceeds the width of the rings. The hairs are very inconspicuous, and more apparent to the touch than to sight. At extreme tip the skin of the tail is whitish, but this character may readily be abnormal.

Mammæ.—There are 8 mammæ, 1 pectoral pair and 3 inguinal pairs.

Feet.—Relatively to the size of the animal, the feet are unusually small and weak. Soles with the six pads rather indistinct in the dry specimen.

Ears.—The ears are in no way peculiar. In length they are about equal to distance between eye and muzzle. They are naked, except for a fine, almost microscopic pubescence.

Skull.—The skull of *Mus pulliventer* differs conspicuously from that of the other Andaman and Nicobar rats in its flat dorsal outline. When viewed from the side the profile is nearly straight from front of nasals to middle of braincase. The palatal profile shares the same peculiarity but to a less degree. Except for its flatness the skull closely resembles that of *Mus rattus*. The rostrum is, however, more elongate, and the audital bullæ are smaller. When viewed from above the plate forming outer wall of antorbital foramen scarcely extends in front of line of outer curve of zygomatic arch, while in *Mus rattus* it projects conspicuously in front of this line. Viewed from the side this plate is narrower and less concave than in *Mus rattus*, and its front edge is nearly straight.

Teeth.—The teeth of the type are somewhat worn, but they appear to be in every way similar to those of *Mus rattus*.

Measurements.—External measurements of type: Total length, 387 mm.; head and body, 202; tail, 185; hind foot, 35 (33); ear from meatus, 19; ear from crown, 14; width of ear, 15.

Cranial measurements of type: Greatest length, 44 mm.; basal length, 40; basilar length, 38; palatal length, 22.6; least width of palate between anterior molars, 4.6; diastema, 12.6; length of incisive foramen, 7.8; combined breadth of incisive foramina, 4; length of nasals, 16; combined breadth of nasals, 4.6; zygomatic breadth, 21.8; interorbital breadth, 6.4; breadth of braincase above roots of zygomatica, 16.2; mastoid breadth, 16.8; occipital depth at front of basioccipital, 13; frontopalatal depth at posterior extremity of nasals, 9.6; least depth of rostrum immediately behind incisors, 7.6; mandible, 25; maxillary tooththrow (alveoli), 7.8; width of front upper molar, 2; mandibular tooththrow (alveoli), 6.8.

Specimens examined.—One, the type.

Remarks.—*Mus pulliventer* differs so conspicuously from its allies of the *Mus rattus* group that it needs no special comparison with any of them. The flattened skull and dark color of the under parts are sharply diagnostic.

MUS ATRATUS, new species.

Type.—Adult female (skin and skull), U.S.N.M. No. 111868, Collected on Barren Island, Andamans, January 7, 1901, by Dr. W. L. Abbott. Original number, 818.

Characters.—Size and proportions as in *Mus andamanensis*, but fur spineless. Color of under parts yellowish brown, back strongly suffused with black (often entirely black). Skull shorter, broader, and more robust than that of *Mus andamanensis*, the audital bullæ smaller. Teeth as in *Mus andamanensis* and *Mus rattus*, but much larger.

Fur.—The fur consists of the usual elements. The spines, however, are so reduced in diameter as to appear like ordinary hairs unless examined with a lens.

Color.—Upperparts almost exactly as in *Mus flebilis* and *Mus andamanensis*, except that the fur is strongly suffused with a slaty black like that of *Mus rattus*. In two of the eight specimens the brown remains in excess of the black, but in the others (including the type) the latter predominates, nearly or quite to the exclusion of the brown. Belly yellowish brown (rather paler and less yellow than the ochraceous buff of Ridgway) in the brown-backed specimens, slaty in the others. Only one skin, however, lacks a distinct brownish wash over the slaty under parts. Feet sprinkled with whitish or slaty hairs. Ears and tail uniform dark brown.

Tail.—The tail is distinctly annulated. At middle there are about ten rings to the centimeter. The boundaries of the scales are sharply defined, much more so than in *Mus stoicus* and *Mus flebilis*. From the base of each scale grow three hairs which in length are equal to the width of two rings. Though better developed than in the larger Andaman rats, these hairs do not conceal the annulation of the tail.

Feet.—The feet are in no way peculiar. Soles naked, 6-tuberculate.

Ears.—The ears are of moderate length, about equal to distance between eye and nostril. They are naked except for a fine, inconspicuous pubescence.

Skull.—The skull is much like that of *Mus rattus*, except that the frontal profile is more strongly concave, the audital bullæ are smaller, and the region between and including anterior zygomatic roots is broader and more heavily built. The incisive foramina extend back nearly to level of middle of first molar.

Teeth.—The teeth are similar to those of *Mus rattus* but very much larger.

Measurements.—External measurements of type: Total length, 342 mm.; head and body, 160; tail, 182; hind foot, 36 (34); ear from meatus, 18; ear from crown, 14; width of ear, 13. Average of seven adults from the type locality: Total length, 353 (342–372); head and body, 175 (160–195); tail, 181 (173–190); hind foot, 39.7 (39–41.6); hind foot without claws, 37.3 (36–39). For detailed measurements see table, page 772.

Specimens examined.—Eight, all from the type locality.

Remarks.—In the appendix to Mouat's Adventures and Researches among the Andaman Islanders Blyth remarks that—

lately the Rev. C. S. P. Parish, the able botanist and chaplain of Moulmein, observed on Barren Island the half-devoured remains of some rat, which it is not likely had been carried by a bird of prey from the nearest land, 36 miles distant. As the carcass was much mutilated, Mr. Parish did not think it worth while to preserve it in spirits, though had he done so the identification of the species, with the peculiar spiny-coated *Mus andamanensis*, would probably have been easy.

This is the only published allusion to the Barren Island rat that I have seen.

Dr. Abbott found the animal excessively abundant in favorable localities among the patches of grass and scrubby jungle with which the volcanic ash and scoria of Barren Island are covered. He noted nothing peculiar in its habits.

MUS BURRUS, new species.

Type.—Adult female (skin and skull), No. 111811, U. S. N. M. Collected on Trinkut Island, Nicobars, February 5, 1901, by Dr. W. L. Abbott. Original number, 881.

Characters.—Size and general appearance much as in *Mus pulliventer*, but tail shorter, back less distinctly grizzled, and belly light buff. Fur spineless. Mammæ 10. Skull much like that of *Mus norvegicus*.

Fur.—The fur is like that of *Mus atratus*, that is, the spines are so reduced in diameter that on casual examination they do not appear different from the surrounding hairs. They are, however, slightly larger than in *Mus atratus*.

Color.—Back and sides a fine grizzle of black and russet, the colors nearly as in *Mus pulliventer*, but grizzle less distinct. The two elements are in about equal parts on back, but on sides the russet is considerably in excess of the black, and at the same time slightly obscured by the drab gray of the underfur. Under parts and inner side of legs cream-buff to base of hairs. Crown and forehead like back, but a little tinged with gray; cheeks washed with drab. Feet scantily clothed with whitish and brownish hairs. Ears and tail uniform dark brown.

Tail.—The tail is coarsely and distinctly annulated. At middle there are about eight rings to the centimeter. To each scale there are from one to three stiff hairs varying in length from 1 to 1½ millimeters.

Mammæ.—There are ten mammæ, four pectoral and six inguinal.

Feet.—The feet are in no way peculiar. Soles naked, with the usual six tubercles.

Ears.—Ears as in the related species.

Skull.—In a general way the skull of *Mus burrus* rather closely resembles that of *Mus norvegicus*. It is slightly smaller than that of the house rat, however, the dorsal profile is less convex, the rostrum shorter and broader, the interorbital region less constricted, the zygomatic arches less flaring, the braincase broader and less elevated, the interpterygoid space wider, and the audital bullæ slightly different in form and more resembling those of *Mus rattus*. Nasal bones gradually narrowed from front to back, their outer margins nearly straight except for the usual slight downward curve. Posterior portion of mandible somewhat deeper than in *Mus norvegicus*.

Teeth.—The teeth are relatively somewhat larger than in the house rat, but the enamel pattern shows no peculiarities.

Measurements.—External measurements of type: Total length, 430 mm.; head and body, 215; tail, 215; hind foot, 43 (41); ear from meatus, 24; ear from crown, 18; width of ear, 17. Average of ten specimens from the type locality: Total length, 407 (385–430); head and body, 205 (195–225); tail vertebræ, 202 (193–215); hind foot, 42.5 (42–43); hind foot, without claws, 40.6 (40–41.4). For detailed measurements, see table, page 772.

Cranial measurements of type: Greatest length, 47.6 mm. (49)¹; basal length, 43 (43.6); basilar length, 40 (41); palatal length, 23.4 (23); least width of palate between anterior molars, 5.4 (5); diastema, 14 (14);

¹Measurements in parenthesis are those of an adult female *Mus norvegicus*.

length of incisive foramen, 8.4 (8.4); combined breadth of incisive foramina, 2.8 (3.8); length of nasals, 17.4 (18.6); combined breadth of nasals, 5 (5); zygomatic breadth, 22 (25); interorbital breadth, 8 (7); mastoid breadth, 17.4 (19); breadth of braincase above roots of zygomata, 17 (16.8); depth of braincase at anterior border of basioccipital, 12.2 (13.6); fronto-palatal depth at posterior extremity of nasals, 11.8 (11); least depth of rostrum immediately behind incisors, 9 (9); mandible, 28 (29); maxillary toothrow (alveoli), 7.6 (7.4); mandibular toothrow (alveoli), 7.4 (7).

Specimens examined.—Twelve, all from Trinkut Island, Nicobars.

Remarks.—In external characters, the series of twelve skins show practically no variation. The younger specimens are less clear buff beneath, but with this exception the color is perfectly constant. The skulls are likewise very uniform. Here the variation is confined to the slight differences in size usually correlated with greater or less age. The nearly straight lateral outline of the nasal is an unvarying characteristic of the entire series of skulls.

Whether *Mus burrus* is a direct descendant of the house rat can not be decided, but its relationship with this wandering species is not remote. The dark color and less spreading zygomata are alone sufficient to distinguish the Nicobarean animal, however, from any of the very numerous specimens of *Mus norvegicus* that have come under my observation.

MUS BURRULUS, new species.

Type.—Adult male (skin and skull), No. 111817, U. S. N. M. Collected on Car Nicobar, January 25, 1901, by Dr. W. L. Abbott. Original number, 865.

Characters.—Similar to *Mus burrus*, but much smaller; hind foot, 38 (36); greatest length of skull, 41.

Color.—The color and other external characters so closely resemble those of *Mus burrus* as to need no detailed description.

Skull.—The skull though differing from that of *Mus burrus* chiefly in its smaller size is also distinguishable by its much more slender rostrum, a character which is in no way due to differences of age. The outer margin of the nasal is straight, as in the larger animal.

Teeth.—The teeth are similar to those of *Mus burrus*, though perceptibly smaller throughout.

Measurements.—External measurements of type: Total length, 357 mm.; head and body, 174; tail, 183; hind foot, 38 (36); ear from meatus, 19; ear from crown, 15; width of ear, 15.

Cranial measurements of type: Greatest length, 41 mm.; basal length, 37.4; basilar length, 34.8; length of nasals, 15; combined breadth of nasals, 4; zygomatic breadth, 19.8; interorbital constriction, 6.8; maxillary toothrow (alveoli), 7.

Specimens examined.—One, the type.

Remarks.—Although represented by only one specimen the rat of isolated Car Nicobar is evidently distinct from those of the larger southern islands. That its small size is not due to immaturity is shown by the fact that the type is fully adult, with distinctly worn teeth, a much older individual than several of the specimens of *Mus burrus*.

MUS BURRESCENS, new species.

Type.—Adult female (skin and skull), No. 111789, U.S.N.M. Collected on Great Nicobar Island March 12, 1901, by Dr. W. L. Abbott. Original number, 926.

Characters.—Externally similar to *Mus burrus*, but red of upper parts a little more intense. Skull distinguishable from that of the related species by the form of the nasal bones, which are strongly contracted a little in front of middle.

Color.—The upper parts are slightly more red than in *Mus burrus* and the grizzle produced by the black hair-tips is less coarse, differences easily appreciable on comparison. Otherwise the two animals are entirely similar so far as external characters are concerned.

Skull.—The skull is like that of *Mus burrus* except in the form of the nasal bones. The outer margin of each nasal, straight or nearly so in *Mus burrus*, is here abruptly concave at middle. The result is a spatulate outline of the two nasals together, quite different from the regular cuneate form characteristic of *Mus burrus* and *Mus burrulus*.

Teeth.—Teeth as in *Mus burrus*.

Measurements.—External measurements of type: Total length, 408 mm.; head and body, 206; tail, 202; hind foot, 40 (38); ear from meatus, 21; ear from crown, 16; width of ear, 15.

Cranial measurements of type: Greatest length, 44.6 mm.; basal length, 40; basilar length, 38; length of nasals, 16; combined breadth of nasals, 5.6; zygomatic breadth, 21.8; interorbital constriction, 6.8; maxillary toothrow (alveoli), 7.4.

Specimens examined.—Two, both from Great Nicobar Island. A specimen from Little Nicobar may represent this species, but it is too young for positive determination.

Remarks.—The cranial character by which this species is distinguished from its allies though trivial is apparently of perfect constancy. In none of the twelve skulls of *Mus burrus* is there any approach to the spatulate form of nasals.

Table of measurements of *Mus andamanensis*, *Mus atratus*, and *Mus burrus*.

Name.	Number.	Sex.	Total length.	Head and body.	Tail.	Hind foot.	Hind foot without claws.
			<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i>
<i>Mus andamanensis</i>	111821	Male	375	183	192	39	37.6
Do.....	111823	do.....	387	175	212	38	36.6
Do.....	111824	Female.....	297	160	137	37	36
Do.....	111826	Male.....	360	176	184	37	35.6
Do.....	111827	Female.....	363	182	181	37	35
Do.....	111829	Male.....	378	188	190	37	36
Do.....	111952	do.....	365	179	186	37	36
Do.....	111953	Female.....	365	175	190	37.6	36
<i>Mus atratus</i>	111862	do.....	316	150	166	38	35.6
Do.....	111863	Male.....	356	175	181	38	35
Do.....	111864	Female.....	352	170	182	40	38
Do.....	111865	Male.....	352	195	180	39	37
Do.....	111866	Female.....	352	172	180	39	36
Do.....	111867	Male.....	322	149	173	39	36
Do.....	111868	Female.....	342	160	182	47	44.6
Do.....	111869	Male.....	372	182	190	39	36.6
<i>Mus burrus</i>	111803	Female.....	405	195	210	42	40
Do.....	111804	Male.....	410	207	203	43	41
Do.....	111805	do.....	435	225	210	43	41
Do.....	111806	Female.....	382	191	191	41	39
Do.....	111807	Male.....	398	196	202	42.6	41
Do.....	111808	Female.....	402	200	202	42	40
Do.....	111809	Male.....	404	206	198	43	41.4
Do.....	111810	do.....	385	197	188	43	41
Do.....	111811	Female.....	430	215	215	43	41.4
Do.....	111812	do.....	388	195	193	41	39
Do.....	111813	do.....	345	165	180	42	40
Do.....	111814	do.....	416	216	200	42	40

¹ Type.**MUS ALEXANDRINUS E. Geoffroy.**

A specimen of the roof rat was taken by Dr. Abbott on Nanhauri Island, Nicobars, February 10, 1901. The measurements are as follows: Total length, 357 mm.; head and body, 172; tail, 185; hind foot, 35 (33). This is the first positive record of the species from the Nicobars or Andamans.

Genus PARADOXURUS F. Cuvier.**PARADOXURUS TYTLERII Tytler.**

1860. *Paradoxurus musanga* vel *typus* (?) BLYTH, Journ. Asiat. Soc. Bengal, XXIX, p. 102. (Port Blair.)

1864. *Paradoxurus tytlerii* TYTLER, Journ. Asiat. Soc. Bengal, XXXIII, p. 188. (Andaman Islands.)

The Andaman palmcivet was first recorded by Blyth in 1860 on the basis of an imperfect skeleton sent to the museum of the Asiatic Society by Captain Hodge, then in command of the guard ship *Sesostriis* at Port Blair. The specimen was in too imperfect condition to be satisfactorily identified with any of the known members of the genus. Four years later Lieutenant-Colonel Tytler, governor of Port Blair, communicated to the Asiatic Society a description of a new species of *Paradoxurus* from the Andaman Islands, by way of introduction to which he remarks:

As the mammalia found on these islands must be of interest, I beg to send you the following description of a new *Paradoxurus* which I have named after myself.

Without doubt this animal is the same as that previously mentioned by Blyth. Apparently Blanford is the only other author who has dealt with the animal. He refers it to *Paradoxurus grayi*, with the observation that it is smaller than the continental form.¹

Dr. Abbott secured one specimen, a fully adult male with somewhat worn teeth. It was trapped in the forest on the shore of MacPherson Strait, South Andaman Island, January 17, 1901. Many tracks were seen in the sand of the neighboring beach. The measurements of this individual are as follows: Total length, 1,040 mm.; head and body, 550; tail, 490; hind foot (without claws), 83; ear from meatus, 42; ear from crown, 31; width of ear, 30. Skull: Greatest length, 108; basal length, 103; basilar length, 100; occipito-nasal length (median), 95; length of nasals (median), 23; length of bony palate (median), 53; width of palate between anterior premolars, 14; width between posterior molars, 29; zygomatic breadth, 61; least interorbital breadth, 21; distance between anterior extremities of auditory bullæ, 16.6; width of braincase above roots of zygomatics, 33.6; mandible, 82; maxillary toothrow (exclusive of incisors), 39; mandibular toothrow (exclusive of incisors), 44.

Genus FELIS Linnæus.

FELIS CHAUS Gueldenstädt.

1863. *Felis chaus* BLYTH, Appendix to Mouat's Adventures and Researches among the Andaman Islanders, p. 351.

That a small yellowish brown cat occurs on South Andaman Island seems fairly well established by the note of Colonel Tytler, quoted by Blyth in the appendix to Mouat's Adventures and Researches. No specimen of the animal has ever been examined, as Tytler merely saw a living individual at a distance of some 150 yards, and the skull found by Dr. Mouat on the occasion of his visit to the island was subsequently lost. Blyth suggests that the animal is probably *Felis chaus*, but this is purely a matter of conjecture.

Genus TUPAIA Raffles.

TUPAIA NICOBARICA NICOBARICA (Zelebor).

1861. *Cladobates nicobaricus* FITZINGER, Sitzungsber. math.-naturwissensch. Cl. Kais. Akad. Wissensch., Wien, XLII (1860), p. 392 (*nomen nudum*).
 1869. *Cladobates nicobaricus* ZELEBOR, Reise der österreich. Fregatte Novara, Zool., I (Wirbelthiere), 1, Mamm., p. 17. (Great Nicobar.)
 1879. *Tupaia nicobarica* ANDERSON, Anat. and Zool. Researches, Western Yunnan (1878), p. 136.

Unless the "large squirrel" observed by Capt. Harold Lewis in 1846² may have been this species, the Nicobar treeshrew escaped notice

¹Proc. Zool. Soc. London, 1885, p. 805. The Fauna of British India, I, Mamm., p. 113, 1888.

²Journ. Asiatic Soc. Bengal, XV, p. 367.

until the year 1858, when it was discovered by the naturalists of the *Novara* expedition. They found it on all the larger Nicobar islands, but most abundantly on Great Nicobar. According to their account it is a noisy animal, uttering a long-drawn "danh-danh" when disturbed or pursued. Nothing of importance has been added to this very meager account of the animal's habit. Dr. Abbott describes it as very active, and generally found in the treetops; apparently more strictly arboreal than other members of the genus.

The series of 18 skins obtained by Dr. Abbott shows that the species is rather variable in color, somewhat more so, in fact, than other members of the genus. In most specimens the color-pattern is like that shown in Zelebor's plate—that is, the dark dorsal area is continued forward along side of shoulder to join that of head, thus completely isolating the yellowish brown mantle from the pale area of the underparts. In others the dark area invades the mantle, reducing it occasionally to a mere trace, but never to its entire obliteration. On the other hand, in a few skins the mantle is so extended as to cover the entire head and shoulders, thus excluding the dark area from the region in front of a point halfway between shoulder and hip. The color of the tail varies from nearly black and concolor with the dark dorsal area to a yellowish brown like that of belly. Though there is a difference in appearance between the brown of the mantle and that of the belly, it is chiefly if not wholly due to the dense silky quality of the fur of the upper parts as compared with the loose, lusterless texture of that beneath. The actual color is difficult to describe, as nothing like it can be found in Ridgway's nomenclature. It most closely approaches buff (Pl. v, fig. 13), but is strongly tinged with wood brown, the glossy fur of the mantle often imparting a peculiar vividness without actually changing the shade. On thighs there is added a faint tinge of drab, which in some specimens appears also on mantle and underparts.

TUPAIA NICOBARICA SURDA, new subspecies.

Type.—Adult male (skin and skull), No. 111757, U.S.N.M. Collected on Little Nicobar Island, March 1, 1901, by Dr. W. L. Abbott. Original number, 899.

Characters.—Similar to *Tupaia nicobarica nicobarica*, but light areas of pelage much less yellow and less contrasted with dark areas.

Color.—Type: Entire underparts, front and hind legs, head, neck, shoulders, and anterior half of back wood brown, tinged with drab posteriorly and on upper parts, with buff elsewhere. An indefinite dark shade on forehead and another on nape, the latter sending back a faint median streak and two still more indistinct lateral shades. On underparts and inner surface of legs the hairs are dull and lusterless and the color clear, but on upper parts and outer surface of legs the

glossy texture of the hairs, together with a very fine annulation (particularly in mantle), imparts a faintly grizzled aspect. Posterior half of back very dark brown, almost black, with here and there a hair which shows a trace of wood brown annulation. Tail deep burnt umber throughout, except at extreme base, where it shades abruptly to black above and to the drab wood brown of belly below.

In other specimens the dark dorsal area is lightened to prouts brown (of a shade considerably darker than Ridgway's Pl. III, fig. 11) and the tail to a pale burnt umber glossed with russet. In most cases, however, the color is like that of the type, or nearly so.

Skull and teeth.—I can not find that the skull and teeth differ from those of *Tupaia nicobarica nicobarica*.

Measurements.—External measurements of type: Total length, 410 mm.; head and body, 190; tail vertebræ, 220; hind foot, 48 (45); ear from meatus, 16; ear from crown, 7; width of ear, 13.4. Average of ten specimens from the type locality: Total length, 388 (370–410); head and body, 176 (170–190); tail, 212 (200–220); hind foot, 47.5 (47–49); hind foot without claws, 44.4 (43.4–45). For detailed external measurements see table, page 776.

Cranial measurements of type: Greatest length, 54 (53)¹ mm.; basal length, 47 (46); basilar length, 46 (45); median palatal length, 28 (27.6); length of nasals (about), 18 (18); distance from lachrymal notch to tip of premaxillary, 21.8 (20.8); diastema, 5 (4.6); width of palate between anterior molars, 9.6 (9.8); lachrymal breadth, 18.4 (17.8); breadth of rostrum at middle of diastema, 7 (7.4); least interorbital breadth, 17.4 (16.4); zygomatic breadth, 28 (28.6); least distance frominion to rim of orbit, 26 (26.6); occipital depth, 12.4 (12); depth from middle of parietal to lower surface of audital bulla, 18 (17.4); depth of rostrum at base of nasals, 8 (8); depth of rostrum at middle of diastema, 5.8 (5.4); mandible, 37 (36); maxillary tooththrow (behind diastema, 19 (19); mandibular tooththrow (behind diastema) 17 (17).

Specimens examined.—Seventeen, all from Little Nicobar Island.

Remarks.—Typical individuals representing the majority of specimens are instantly recognizable, as compared with similar material from Great Nicobar, by the dull, relatively lusterless, and ill-contrasted color of the mantle and thighs, as well as by the less yellow underparts. The mantle is less often outlined by a dark shade at the side than in the typical form. Occasionally a specimen may be found which can not be certainly referred to either race, but taking the series as a whole the characters are readily appreciable.

¹Measurements in parentheses are those of an adult male *Tupaia nicobarica nicobarica*.

Table of measurements of *Tupaia nicobarica nicobarica* and *T. niobarica surda*.

Name.	Number.	Sex.	Total length.	Head and body.	Tail.	Hind foot.	Hind foot without claws.
			<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i>
<i>Tupaia nicobarica nicobarica</i>	111764	Female ad..	385	175	210	47.6	44
Do.	111765	do.....	410	190	220	49.6	46
Do.	111771	do.....	410	187	223	50	47
Do.	111773	do.....	392	187	205	50	46
Do.	111777	do.....	413	192	221	48	45
Do.	111778	do.....	395	180	215	47.4	44
Do.	111779	do.....	402	187	215	48	45
Do.	111766	Male juv ..	383	180	203	46	44
Do.	111767	Male ad ..	415	195	220	49.6	46
Do.	111768	do.....	375	185	190	50	46
Do.	111769	do.....	380	180	200	47	44
Do.	111770	do.....	390	180	210	47	44
Do.	111772	do.....	396	190	206	47	44
Do.	111774	do.....	410	195	215	48	45
Do.	111776	do.....	410	178	232	48	45
Do.	111780	do.....	416	191	225	47	44.6
<i>Tupaia nicobarica surda</i>	111749	Male	404	189	215	47	43.4
Do.	111750	do.....	390	170	220	49	45.6
Do.	111751	Female	390	170	220	47	44
Do.	111752	Male	390	190	200	49	45
Do.	111753	do.....	380	180	200	47	44
Do.	111754	Female	405	190	215	47	44
Do.	111755	do.....	395	185	210	47	44
Do.	111756	Male	390	175	215	47	44.6
Do.	111757	do.....	410	190	220	48	45
Do.	111758	Female	390	180	210	47.6	44.6
Do.	111759	Male	400	185	215	47.6	44
Do.	111760	do.....	403	178	225	47.6	45
Do.	111761	do.....	400	180	220	48	45
Do.	111762	Female	400	190	210	49	45.6
Do.	111763	do.....	382	182	200	48	45
Do.	111775	do.....	410	185	225	48.4	45
Do.	111781	do.....	420	190	230	50	47

¹ Type.

GENUS CROCIDURA Wagler.

CROCIDURA NICOBARICA, new species.

Type.—Adult female (in alcohol), No. 111788, U.S.N.M. Collected on Great Nicobar Island, March 15, 1901, by Dr. W. L. Abbott. Original number, 931.

Characters.—Largest known oriental member of the subgenus *Crocidura*; total length, about 210 mm. General color, sooty brown.

Fur.—The fur is dense and velvety, the hairs on middle of back about 4 mm. in length, with a few longer ones interspersed.

Color.—Dorsal surface prouts brown (slightly darker than Ridgway's Pl. III, fig. 11), somewhat grizzled in certain lights by the silvery gray reflections from the hairs. Sides, underparts, and both surfaces of legs broccoli brown, slightly washed with wood brown. On middle of chest there is an elongate patch of gray, very nearly Ridgway's gray No. 8, but faintly washed with broccoli brown. Ears, tail, and feet an indefinite fleshy brownish, the thin sprinkling of minute hairs not affecting the color.

Tail.—The tail is so minutely and indistinctly annulated that, at first sight, its surface appears to be smooth. On close inspection the rings become visible, about thirty to the centimeter at middle. Numerous dark hairs with silvery reflections spring from the border of each

ring. In length they slightly exceed the width of the rings. These hairs are invisible without the aid of a lens, except when seen in profile against a white surface, or when certain lights cause them to appear as a silvery pubescent sheen. With the short hairs are sparsely intermingled cilia, 10 mm. in length.

Mammæ.—Apparently there are two inguinal mammæ on each side, but the specimen is sufficiently mutilated to make the count uncertain.

Feet.—Both soles and palms are naked and 6-tuberculate. The surface between the tubercles is finely reticulated.

Skull.—The skull exactly resembles that of Kashmir specimens of *Crocidura (Pachyura) "murina,"* except that the size is a trifle less. So far as can be determined from a single specimen the skull of the fully developed adult Nicobar shrew is less angular than that of *C. "murina"* of the same age.

Teeth.—The teeth resemble those of *Crocidura "murina."* The first unicuspid is, however, distinctly smaller than in the Kashmir animal, and the two succeeding teeth are faintly larger. As a result there is less contrast in the size of the unicuspids, though the relative proportions remain the same—that is, the first is much larger than the third, which in turn exceeds the second. Of the fourth unicuspid, well developed in *C. "murina,"* there is no trace.

Measurements.—External measurements of type: Total length, 210 mm.; head and body, 120; tail, 90;¹ hind foot, 24¹ (23); ear from meatus, 11; ear from crown, 5; width of ear, 11.

Cranial measurements of type: Greatest length (exclusive of incisors), 27 (29) mm.;² basal length, 26 (28); basilar length, 24 (26); palatal length, 11.8 (12.4); width of palate between middle molars, 3.6 (4); mastoid breadth, 11.6 (12.8); lachrymal breadth, 6.2 (6.2); mandible (without incisor), 15 (14.8); maxillary toothrow, 12.8 (13); mandibular toothrow, 12 (12).

Specimens examined.—One, the type.

Remarks.—This species is readily distinguishable among the hitherto known oriental members of the subgenus *Crocidura* by its very large size, a character in which it is approached by its representative in the Andaman Islands only. Some of the larger African species are, however, of about the same measurements.

CROCIDURA ANDAMANENSIS, new species.

Type.—Adult male (skin and skull), No. 111825, U.S.N.M. Collected at MacPherson Strait, South Andaman Island, January 16, 1901, by Dr. W. L. Abbott. Original number, 851.

¹ Slightly damaged.

² Measurements in parentheses are those of a female *Crocidura "murina,"* from Kashmir. It is from an individual which appears to be full grown, but in which the suture between the basioccipital and basiphenoid is still open. In the type of *C. nicobarica* this suture is obliterated.

Characters.—In size nearly equal to *Crocidura nicobarica*; general color, bluish gray.

Fur.—The fur is somewhat longer and less dense than in the type of *C. nicobarica*, that on middle of back about 8 mm. in length. This character is probably individual.

Color.—Entire body and head gray (very nearly Ridgway's No. 8), everywhere washed with broccoli brown. This wash is most noticeable on dorsal surface, where the effect of the two colors is drab gray. On underparts the brown is distinctly visible in some lights, scarcely so in others. Feet, yellowish brown; tail and ears, dark brown.

Skull.—The skull is in every way similar to that of *Crocidura nicobarica*, except that it is somewhat smaller.

Teeth.—In general the teeth of *Crocidura andamanensis* closely resemble those of *C. nicobarica*. The unicuspid are, however, actually as well as relatively larger, and the contrast in size between the second and the other two is more marked.

Measurements.—External measurements of type: Total length, 200 mm.; head and body, 114; tail, 86; hind foot, 26 (25).

Cranial measurements of type: Greatest length (exclusive of incisors), 25.6 mm.; basal length, 24.8; basilar length, 22; palatal length, 11; width of palate between middle molars, 3.2; mastoid breadth, 11; lachrymal breadth, 6; mandible (without incisor), 15; maxillary tooth-row, 12; mandibular tooth-row, 11.

Specimens examined.—One, the type.

Remarks.—This species, though closely related to *Crocidura nicobarica*, appears to be well characterized by its smaller size, larger unicuspid teeth, and distinctly gray color.

Genus SCOTOPHILUS Leach.

SCOTOPHILUS TEMMINCKII (Horsfield).

1863. *Nycticejus temminckii* BLYTH, Appendix to Mouat's Adventures and Researches among the Andaman Islanders, p. 354 (Nicobars).

In the Appendix to Monat's Adventures and Researches Blyth writes: "From the Nicobars have been received *Hipposideros murinus* (Elliot) and *Nycticejus temminckii* (Horsfield) . . ." This is the only record of Temminck's bat from either group of islands. It was apparently overlooked by Blanford, who does not include either Nicobars or Andamans in the range of the species.

Genus TYLONYCTERIS Peters.

TYLONYCTERIS PACHYPUS (Temminck).

1876. *Vesperugo pachypus* DOBSON, Monogr. Asiat. Chiropt., p. 210 (Andamans).

Although they are not mentioned in the body of the work, Dobson records sixteen Andaman specimens of this bat in the catalogue of Chiroptera in the Indian Museum forming part of the Appendix to the

Monograph of Asiatic Chiroptera. Nothing is known of the history of these specimens except that they were collected in 1871 and 1872 by Dr. Stoliczka, J. Homfray, and James Wood-Mason.

Genus **PIPISTRELLUS** Kaup.

PIPISTRELLUS TICKELLI (Blyth).

1876. *Vesperugo tickelli* DOBSON, Monogr. Asiat. Chiropt., p. 208 (Andamans).

Three specimens of Tickell's bat, collected by Colonel Tytler in the Andaman Islands, are recorded by Dobson in the catalogue of specimens of Chiroptera in the Indian Museum, which forms part of the Appendix to the Monograph of the Asiatic Chiroptera. Nothing further is known of the animal as an inhabitant of the islands.

PIPISTRELLUS CAMORTÆ, new species.

1861. ?*Vesperugo nicobaricus* FITZINGER, Sitzungsber. Math.-Naturwissensch. Cl. Kais. Akad. Wissensch., Wien, XLII (1860), p. 390 (*nomen nudum*).

1869. ?*Vesperugo tenuis* ZELEBOR, Reise der österreichischen Fregatte Novara, Zool., I (Wirbelthiere), 1, Mamm., p. 16 (Nicobars).

1876. ?*Vesperugo abramus* DOBSON, Monogr. Asiat. Chiropt., p. 212 (Nicobars).

Type.—Adult male (in alcohol) No. 111897, U.S.N.M. Collected on Kamorta Island, Nicobar Islands, February 12, 1901, by Dr. W. L. Abbott.

Characters.—Externally much like Javan specimens of *Pipistrellus abramus*, but slightly smaller, the ears shorter and broader, and penis considerably shorter than tibia. Skull with broader rostrum and smaller audital bullæ. Teeth as in *P. abramus*, the inner upper incisor bifid.

Ears.—The ear is moderately long; laid forward it extends about to nostril. Anterior border nearly straight from base to broadly rounded-off tip. Posterior border straight from just below tip to about middle, then strongly convex to notch isolating low but well-developed anti-tragus. Tragus short and broad, its greatest width nearly equal to length of anterior border. Posterior outline evenly convex except where interrupted by a small but very distinct lobe near base. Anterior border slightly concave.

Feet.—The foot is smaller than in *Pipistrellus abramus*. Calcar fading insensibly into uropatagium, but provided with a very distinct keel, considerably larger than that of *P. abramus*.

Membranes.—The membranes are thin and delicate, but do not show any peculiarities of importance. They are naked except close to body. Wing from base of outer toe.

Penis.—The penis, though much larger than in *Pipistrellus pipistrellus* and *P. kuhli*, lacks the enormous development characteristic of *P. abramus*. Its length equals about two-thirds that of tibia.

Color.—After several months immersion in alcohol the color is a

uniform dark brown above (the exact shade intermediate between the bistre and burnt umber of Ridgway), and a lighter brown (between wood brown and cinnamon) beneath. Fur everywhere blackish at base. Ears and membranes blackish brown, the wing faintly edged with white.

Skull and teeth.—The skull resembles that of *Pipistrellus abramus* in general size and form, but the rostral portion is very noticeably broader and shorter. Audital bullæ smaller than in *P. abramus*, but not different in form.

Teeth as in *Pipistrellus abramus*, but more robust.

Measurements.—External measurements of type: Total length, 78 mm. (80);¹ head and body, 48 (48); tail, 30 (32); tibia, 12 (11.6); foot, 6.8 (6.6); penis, 9; forearm, 31.6 (32); thumb, 5 (5.4); second digit, 31 (30); third digit, 52 (55); fourth digit, 47 (51); fifth digit, 40 (42); ear from meatus, 11.4 (12); ear from crown, 9 (9); width of ear, 10.6 (10.6); tragus (anterior border), 3 (4).

Cranial measurements of type: Greatest length, 12.6 mm. (13);² basal length, 12 (12.2); basilar length, 9 (9.8); zygomatic breadth, 9 (8.8); least interorbital breadth, 3.6 (3.6); greatest length of braincase, 7.8 (8); greatest breadth of braincase above roots of zygomatics, 7 (6.8); mandible, 10 (9.8); maxillary toothrow (exclusive of incisors), 5 (5); mandibular toothrow (exclusive of incisors), 5 (5).

Specimens examined.—Two (in alcohol), both from the type locality.

Remarks.—*Pipistrellus camortii* appears to be a well-marked species, related more closely to *P. abramus* than to any other. It is undoubtedly the bat which Dobson recorded from the Nicobars in the list of specimens of *Vesperugo abramus* in the collection of the East Indian Museum. Probably it is also the species named *Vesperugo nicobaricus* by Fitzinger, but afterwards regarded by Zelebor as *V. tenuis*.

Genus MINIOPTERUS Bonaparte.

MINIOPTERUS PUSILLUS Dobson.

1876. [*Miniopterus schreibersii*] var. *Miniopterus pusillus* DOBSON, Monogr. Asiat. Chiropt., p. 162 (Nicobar Islands).

Although the range of this bat is given by Dobson as probably including the same countries as that of *M. schreibersii*, Anderson states that the type specimen in the Indian Museum, Calcutta, was collected among the Nicobar Islands by Dr. Stoliczka.³ Nothing is known of the species beyond the facts that it is apparently common on the Nicobar Islands, and that it has been recorded from the Andamans and also from Madras. Dr. Abbott did not meet with it.

¹ Measurements in parenthesis are those of an adult female from the type locality.

² Measurements in parenthesis are those of an adult female *Pipistrellus abramus* from Buitenzorg, Java.

³ Catal. Mamm. Ind. Mus. Calcutta, 1881, p. 146. Though no definite locality is given for the type specimen, fifteen others are recorded from Kachal Island.

Genus RHINOLOPHUS E. Geoffroy.

RHINOLOPHUS ANDAMANENSIS Dobson.

1872. *Rhinolophus andamanensis* DOBSON, Journ. Asiat. Soc. Bengal, XLI, Pt. 2, p. 337. (South Andaman Island.)

The type and only known specimen of this bat was collected by Mr. Homfray, assistant superintendent at Port Blair. Nothing is known of the animal's habits or distribution.

Genus HIPPOSIDEROS Leach.

HIPPOSIDEROS NICOBARENSIS (Blanford).

1871. *Phyllorhina nicobarensis* DOBSON, Journ. Asiat. Soc. Bengal, XL, Pt. 2, p. 262.
 1891. *Hipposideros nicobarensis* BLANFORD, The Fauna of British India, Mamm., p. 286.

Nothing is known of this bat, except that the type specimen, now in the collection of the Indian Museum, Calcutta, was collected among the Nicobar Islands by Dr. Stoliczka. According to Dobson its relationships are with *H. diedemata*.

HIPPOSIDEROS NICOBARULÆ, new species.

1876. *Phyllorhina bicolor* DOBSON, Monogr. Asiat. Chiropt., p. 70 (Nicobars).

Type.—Adult male (in alcohol), No. 111874, U.S.N.M. Collected on Little Nicobar Island, March 2, 1901, by Dr. W. L. Abbott.

Characters.—Closely related to *Hipposideros bicolor* and *H. fulvus*, with which it agrees in all general external features. Size much less than that of *H. fulva* and slightly greater than in *H. bicolor*. Terminal erect portion of noseleaf broader than in *H. bicolor*; skull more inflated in front of orbits, and with broader palate and interpterygoid region.

Noseleaf.—The noseleaf is slightly larger than that of *Hipposideros bicolor*, but not essentially different in form. The posterior erect portion is slightly broader, but the difference may be in part sexual, as the only specimen of *H. bicolor* at hand is a female.

Color.—Two distinct color phases occur. In the dark phase, represented by the type, the hairs of the back are seal brown through terminal third, light smoke gray basally in strong contrast. On underparts the fur is broccoli brown throughout, the hairs slightly darker at tip. In the light phase the whole body is mars brown, the hairs everywhere light gray at base, but this feature most noticeable on back. Ears and membranes blackish. This description is based on specimens that have been immersed in alcohol for about six months.

Skull and teeth.—The skull is so much smaller than that of *Hipposideros fulvus* that it needs no special comparison. From the skull of *H. bicolor* it differs in slightly larger size and in several details of structure. The width of the constricted portion of the palate is con-

siderably greater than in the allied species, and the interpterygoid space is wider in proportion to its length. Antorbital region more inflated than in either of the allied species.

The teeth show no peculiarities of form. They are intermediate in size between those of *Hipposideros bicolor* and *H. fulvus*.

Measurements.—For external measurements see table below.

Cranial measurements of type: Greatest length, 16.4 (16) mm.;¹ basal length, 14 (14); basilar length, 12.8 (12.8); zygomatic breadth, 8.4 (8.2); least interorbital breadth, 2.2 (2.4); mastoid breadth, 9.4 (8.6); greatest length of braincase, 10 (10); greatest breadth of braincase above roots of zygomata, 7 (7); frontopalatal depth (at middle of molar series), 3 (3); depth of braincase, 5.8 (5.4); maxillary toothrow (exclusive of incisors), 5.6 (5.4); mandible, 10 (10); mandibular toothrow (exclusive of incisors), 6 (6).

Specimens examined.—Twenty-five, all from the type locality.

Remarks.—Though in some respects intermediate between *Hipposideros bicolor* and *H. fulvus*, this species is so readily distinguishable as to need no special comparison.

Table of measurements of *Hipposideros nicobarulæ*.

Number.	Sex.	Total length.		Tail.	Tibia.	Foot.	Calcar.	Forearm.	Thumb.	Second finger.	Third finger.	Fourth finger.	Fifth finger.	Ear from meatus.	Ear from crown.	Width of ear.
		Mm	Mm													
111871.....	Male	78	30	17	7	9	40	5.6	34	64	50	53	18	15.4	17	
111872.....	do	81	33	17	6.4	10	40	5.4	32	61	51	54	17.4	15	18	
111874.....	do	77	31	16	7	9.4	39	5.6	32	63	49	52	19	14.6	17.6	
111876.....	do	75	29	16	7	9	39	6	32	66	52	55	18	14	17	
111885.....	do	75	29	18	6.8	10	40	6	32	65	51	54	19	14	17.4	
111895.....	do	78	31	17	7	9	39	5.6	33	65	50	54	19	15	17	
111875.....	Female.....	83	32	18	6.6	10	41	5.6	33	65	53	55	20	16	18.4	
111877.....	do	76	27	16	7	9	40	5	32	63	49	53	18.6	15	16	
111887.....	do	85	34	18	6.8	10	40	6	32	65	52	56	20	15.6	17.4	
111888.....	do	81	33	18	7	11	41	6.6	35	68	54	56	19	15	18	
111894.....	do	83	34	18.4	6.6	10	42	6	33	65	52	55	19	15	17.6	

¹Type.

Genus PTEROPUS Brisson.

PTEROPUS NICOBARICUS Zelebor.

1846. *Pteropus edulis* BLYTH, Journ. Asiat. Soc. Bengal, XV, p. 367. (Nicobar Islands.)

1861. *Pteropus nicobaricus* FITZINGER, Sitzungsber. Math.-Naturwissensch. Cl. Kais. Akad. Wissensch., Wien, XLII (1860), p. 389. 1861. (*Nomen nudum*.)

1869. *Pteropus nicobaricus* ZELEBOR, Reise der österreichischen Frigate Novara, Zool., I (Wirbelthiere), 1, Mamm., p. 11. (Car. Nicobar.)

The earliest notice of the Nicobar fruitbat appears to be that in

¹ Measurements in parentheses are those of an adult female *Hipposideros bicolor* from Sumatra. Some of the cranial dimensions of an adult male *H. fulvus* from Deccan, India, are as follows: Greatest length, 18; basal length, 15.6; zygomatic breadth, 9.4; interorbital constriction, 2.8; maxillary toothrow (exclusive of incisors), 6.4.

Blyth's Notes on the Fauna of the Nicobar Islands, published in 1846.¹ The animal was here recorded as *Pteropus edulis*; but that Blyth was not satisfied with this determination is shown by the stress laid on the peculiarities of the specimens. His entire account is as follows:

Pteropus edulis: *Pt. javanicus*, Horsf., etc. Three specimens are remarkable for having the throat and front of the neck black, the head blackish, the nape dull reddish-brown, the back shining black, flanks and vent dull black, and the rest of the underparts dull reddish brown, much paler in the center.

This is an excellent description of *Pteropus nicobaricus*. In 1863 Blyth applied to these specimens the name *Pteropus melanotus*, but this, according to Dobson, at least²—I have not seen the work where it occurs³—is a *nomen nudum*. Meanwhile the naturalists of the *Novara* expedition had discovered the animal on Car Nicobar; and the name *Pteropus nicobaricus* had been published. This name as it appeared in 1860 was purely a *nomen nudum*, and not until 1869 was it properly defined. The correct specific name for this bat is therefore open to serious question, since any positive means of connecting Blyth's *Pteropus melanotus* of 1863 with his description of 1846 would preclude the use of *nicobaricus*.

In the supplement to Mouat's Adventures and Researches Among the Andaman Islanders, 1863, Blyth states that no *Pteropus* has yet been observed upon the Andamans; but in 1876 Dobson records *P. nicobaricus* from both Andamans and Nicobars, while two years later he gives the range as including the Andamans, Nicobars, Java, and Pulo Condor. I am inclined to doubt the authenticity of these records, though I have had no opportunity of examining the specimens on which they are based. That a *Pteropus* is abundant on some of the Andaman Islands is shown by Hume's account of a species observed in 1873.

As we were returning [he writes],⁴ thousands of huge flying foxes (*Pteropus nicobaricus* they proved to be) poured out from the higher trees on this side of the island [the smaller Jolly Boy] in one continuous stream. We shot five or six; those that were not quite dead we retrieved as they floated, but those that were killed outright sank like stones, and we only succeeded in fishing up one of these that we marked exactly, and then saw lying black on the coral bottom that shone up white and bright in the moonlight.

Other records of specimens from the Andamans may be found in Anderson's Catalogue of the Mammalia in the Indian Museum.⁵ Here is mentioned also a skull from Mergui, but it has no history, and the locality given is probably erroneous.⁶

¹ Journ. Asiat. Soc. Bengal, XV, pp. 367-379 (Mammalia, pp. 367-368).

² Monogr. Asiat. Chiropt., 1876, p. 17.

³ Catal. Mamm. Mus. Asiat. Soc. Bengal, 1863, p. 20.

⁴ Stray Feathers, II, p. 61, 1874.

⁵ Pp. 102-103.

⁶ See Blanford, The Fauna of British India, Mamm., 1891, p. 261.

Dr. Abbott obtained sixteen adults, eight from Great Nicobar, and eight from Tillanchong. On Car Nicobar, the type locality of the species, he found only the very different *P. fannulus*.

There is considerable individual variation in both color and size, but taken as a whole the series from the two islands are not distinguishable from each other. The variation in size is shown in the table of measurements below; that in color is for the most part confined to the mantle. The entire head in front of ears and the back is blackish, only occasionally tinged with brown. Underparts blackish along sides and across throat, the lower neck usually suffused with an indefinite reddish brown. Middle of chest and belly light brown, in strong contrast with sides and throat. The color of this area is essentially the same as that of the mantle, and like the latter very difficult to describe with any degree of accuracy. In none of the specimens, however, is it as pale as the extreme phase of the mantle. In a general way it may be described as an ochraceous buff, rather yellower than that of Ridgway (Pl. v, No. 10). Along median line of belly this is usually tinged with drab, and at sides, just before merging into the black lateral area, with russet. The hairs have a conspicuous silky gloss in certain lights. The mantle, while generally of the same ground color is occasionally a very light buff or cream buff. In these specimens the color is nearly uniform, but in the more usual phase the median and anterior portion of the mantle is strongly suffused with red. This suffusion may be a dull brownish hazel, a clear cinnamon rufous, or both on different parts of the mantle. In such cases the browner tints are usually near center. Ears, membranes, feet, and naked portion of face uniform blackish brown in the dried specimens.

Table of measurements of *Pteropus nicobaricus*.

Locality.	Number.	Sex.	Length.	Extent of wings.	Tibia.	Foot.	Calcar.	Forearm.	Thumb.	Second finger.	Third finger.	Fourth finger.	Fifth finger.	Ear from meatus.	Ear from crown.	Width of ear.
			Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.
Great Nicobar.....	1111736	Male	260	1250	74	54	13	163	70	130	300	245	220	28	22	19
Do.....	1111737	do	260	1185	75	51	16	155	68	115	295	230	210	25	20	18
Do.....	1111738	do	247	1185	65	47	16	150	70	120	290	230	210	29	23	18
Do.....	1111739	do	280	1215	77	48	17	160	67	120	300	246	220	25	19	18
Do.....	1111740	do	260	1200	---	50	16.6	156	72	120	310	240	220	30	25	19
Do.....	2111748	do	300	---	80	50	18	170	70	130	330	245	220	30	23	22
Do.....	1111742	Female.	250	1180	76	47	15	150	72	120	305	230	214	28	22	17
Tillanchong Island.	1111731	Male	255	1180	76	54	18	150	69	120	300	240	215	26	20	16
Do.....	1111732	do	250	1170	73	52	15	155	65	117	300	285	195	28	22	17
Do.....	2111746	do	300	---	78	50	15	157	60	120	310	235	210	27	22	18
Do.....	1111729	Female.	---	---	75	48	17	150	70	115	295	228	207	27	22	16.6
Do.....	1111733	do	237	1170	72	53	16	155	70	118	308	233	210	27	21	16.6
Do.....	1111734	do	250	1170	77	49	18	157	70	120	300	237	215	28	20	16.6
Do.....	1111735	do	240	1150	74	51	17	157	70	122	300	230	215	26	21	16
Do.....	2111747	do	305	---	72	43	20	160	68	120	290	230	200	24	20	18

¹ Skin; length and extent from fresh specimen by collector.

² In alcohol.

PTEROPUS FAUNULUS, new species.

Type.—Adult male (skin and skull) No. 111730, U.S.N.M. Collected on Car Nicobar, January 23, 1901, by Dr. W. L. Abbott. Original number 864.

Characters.—A member of the subgenus *Spectrum* as defined by Matschie. Size very small (forearm 110 mm.); ears triangular-pointed; color tawny, the face and back strongly tinged with hair brown; skull and teeth essentially as in *Pteropus lepidus*¹ but much smaller.

Fur.—The fur of the back is silky in texture and closely appressed, the individual hairs 10–12 mm. in length. On rump, thighs, and interfemoral region it becomes distinctly woolly in texture, though less so than on other parts of the body. It extends on leg to knee, below which there is a sparse sprinkling of hairs along inner surface of tibia. Fur of shoulders, head, neck, and underside of body loose and woolly in texture, therefore appearing much longer than that of back, though the length of the individual hairs is everywhere about the same. On under surface the fur extends about to knee and elbow. Beyond the latter point it is continued as a sparse sprinkling of fine hairs to middle of forearm.

Membranes.—The membranes show few peculiarities worthy of note. The uropatagium is reduced to a mere rim, except along legs, where it is about 12 mm. in width. Between knee and body it is entirely concealed by the fur above, but only partially below. Propatagium naked above, sprinkled with fine hairs below. Wing membranes entirely naked above except for an inconspicuous sprinkling of fine hairs close to body and along forearm. Below they are scantily furred to line joining elbow and knee, also along forearm.

Ears.—The ears are of moderate size, proportionally about as in *Pteropus lepidus*, *P. hypomelanus* or *P. nicobaricus* and smaller than in *P. medius* from Tenasserim and Lower Siam. In form they are quite distinct from those of any of the related species. Anterior border nearly straight from base to about middle, then after a faint convexity again nearly straight to tip. Extremity very narrowly rounded, less than 1 mm. in width. Posterior border nearly straight from tip to a little above middle, then abruptly convex for a distance of a few millimeters; beyond this, nearly straight to slightly above small but distinct antitragal lobe. At tip the anterior and posterior borders form an angle of about 80°. The convexity of the posterior border is so abrupt as to be almost angular.

Color.—Back hair brown, considerably darker than Ridgway's Pl. III, fig. 12, everywhere intermixed with ochraceous buff. Anteriorly the brown is in excess of the buff, but posteriorly the buff becomes more conspicuous until on rump it practically excludes the darker

¹ For figure see Proc. Washington Acad. Sci., II, p. 238, August 20, 1900.

color. The entire back is sprinkled with silvery whitish hairs which are most conspicuous anteriorly. Mantle, head and entire underparts ochraceous buff, brighter than that of back and strongly tinged with tawny on chest, sides of neck, and middle of breast and belly. Face, cheeks, and chin grizzled hair brown. Ears and membranes blackish.

Skull and teeth.—The skull and teeth show a remarkable likeness to those of *Pteropus lepidus*, though immediately distinguishable by their much smaller size. The interorbital region is, however, actually broader than in the larger species, and the postorbital processes are more robust. Pterygoids distinctly convergent posteriorly, imparting to outline of interpterygoid space a distinctly lyrate form. The teeth both above and below agree almost exactly with those of *Pteropus lepidus*, except that the cusps are not as high and the crown is relatively wider between the cusps.

Measurements.—External measurements of type (from well-made skin): Head and body, 170 mm.; tibia, 38; foot, 34 (30); calcar, 13.6; forearm, 110; thumb, 49 (38); second digit, 82; third digit, 220; fourth digit, 168; fifth digit, 153; ear from meatus, 22; ear from crown, 19; width of ear, 14.

Cranial measurements of type: Greatest length, 54 (64)¹ mm.; basal length, 48.6 (60); basilar length, 46 (58); median palatal length, 28 (36); palatal breadth (between anterior molars), 9 (11.4); zygomatic breadth, 28 (33.6); least interorbital breadth in front of postorbital processes, 7 (8); least interorbital breadth behind postorbital processes, 7.6 (7); breadth between tips of postorbital processes, 19 (21.6); greatest breadth of braincase above, roots of zygomata, 20.2 (22.8); greatest depth of braincase, 17.6 (17.8); occipital depth, 11.6 (11.8); depth of rostrum at middle of diastema, 7.8 (8); mandible, 40 (50); maxillary tooththrow (exclusive of incisors), 19 (25); mandibular tooththrow (exclusive of incisors), 22 (27.6); crown of first upper molar, 3.4 by 2.6 (5.6 by 3); crown of first lower molar, 3.6 by 2 (4.4 by 2.4).

Specimens examined.—One, the type.

Remarks.—*Pteropus fannulus* is a very strongly marked species, easily recognized by its small size and pointed ears. The single specimen was shot in dark forest. It was apparently not very common. *Pteropus nicobaricus*, originally described from a Car Nicobar specimen was not found on the island by Dr. Abbott.

PTEROPUS VAMPYRUS Linnaeus.

1869. [*Pteropus edulis*] var. *Pachysoma giganteum* ZELEBOR, Reise der österreichischen Fregatte Novara, Zool., I (Wirbelthiere), 1, Mamm., p. 10 (Car Nicobar).

1878. *Pteropus edulis* DOBSON, Catal. Chiropt. Brit. Mus., p. 50.

There appears to be little doubt that a large *Pteropus*, not *P. nicobaricus*, occurs in the Nicobar Islands, and that the same, or a closely

¹Measurements in parenthesis are those of the type of *Pteropus lepidus*.

related form, inhabits the Andamans. Whether this animal is true *Pteropus vampyrus* or not I am unable to say, as Dr. Abbott obtained no specimens. The fact that Zelebor distinguished it under the name *Pachysoma giganteum* points strongly to the distinctness of the species. That *Pachysoma giganteum* is not *Pteropus faunulus* is shown by Zelebor's diagnosis, *Gula malis maculaque inter frontem et oculos brunneo-nigris, genis, nucha et dorso superiore clare flavescente-castaneis, dorso reliquo, pectore et abdomine brunneo-nigris, pilis nonnullis albido vel pallide cinereo terminatis*, and by the fact that it was referred as a variety to the very large *Pteropus edulis* (= *vampyrus*). Three flying-foxes, therefore, have been taken on Car Nicobar, the large *Pteropus vampyrus*, the medium-sized *P. nicobaricus*, and the small *P. faunulus*.

Genus CYNOPTERUS F. Cuvier.

CYNOPTERUS BRACHYSOMA Dobson.

1871. *Cynopterus brachysoma* DOBSON, Journ. Asiat. Soc. Bengal, XL, Pt. 2, p. 260. (South Andaman Island.)

The thick-bodied fruitbat is at present known from the type specimen only, an adult female obtained by Dr. Stoliczka on South Andaman Island¹ in 1871. This, however, is probably the species referred to by Blyth in the appendix to Mouat's Adventures and Researches among the Andaman Islanders² under *Cynopterus marginatus*. He says:

The *Cynopterus* is the only species of bat as yet received from the Andamans; but Colonel Tytler writes word that "there is a great abundance of small bats on the island [South Andaman], and I am surprised that you have not received any."

CYNOPTERUS BRACHYOTIS Müller.

1873. *Cynopterus marginatus* var. *andamanensis* DOBSON, Journ. Asiat. Soc. Bengal, XLII, Pt. 2, p. 201, September 8, 1873. (Andaman Islands.)
1876. *Cynopterus brachyotus* DOBSON, Monagr. Asiat. Chiropt., p. 26.

It is very probable that the specific name *andamanensis* will eventually stand for this species, as the *Cynopterus brachyotis* of Müller was originally described from Borneo. Beyond the fact that Dobson's type specimen was procured among the Andaman Islands nothing is known of the status of this bat as a member of the fauna under consideration.

¹ See Blanford, Fauna of British India, I, p. 265, 1891. ² P. 354, 1863.

CYNOPTERUS SCHERZERI (Zeleebor).

1861. *Pachysoma scherzeri* FITZINGER, Sitzungsber. Math.-Naturwissensch. Cl. Kais. Akad. Wissensch., Wien, XLII (1860), pp. 385, 390 (*nomen nudum*).
1869. [*Cynopterus marginatus*] var. *Pachysoma scherzeri* ZEELEBOR, Reise der Fregatte Novara, Zool., I (Wirbelthiere), 1, Mamm., p. 13 (Car Nicobar).
1876. *Cynopterus scherzeri* DOBSON, Monagr. Asiatic Chiroptera, p. 26 (Car Nicobar).
1888. *Cynopterus scherzeri* BLANFORD, Fauna British India, Mamm., p. 264, June, 1888. (Car Nicobar, Timor?).

Nothing is known of the habits of this animal except that it is commonly found hanging beneath the leaves of the cocoanut palm. It was first recorded by Fitzinger in his nominal list of the mammals collected by the members of the *Novara* Expedition. Dr. Abbott secured a single specimen, an adult female, on Car Nicobar, January 25, 1901. He saw several others.

The material at hand is not sufficient to determine the status of *Cynopterus scherzeri*. The animal is much like *C. montanoi* from Singapore, and *C. sphinx* from the peninsula of India, but the ears are smaller, the color is darker (vandyke brown instead of cinnamon), and the pale phalanges are less contrasted with the blackish wing membranes. Skull apparently smaller and narrower than that of *C. montanoi* or *C. sphinx*.

Measurements of the Abbott specimen: Head and body, 100 mm.; tail, 12.7; expanse of wings, 470; tibia, 25.6; foot, 16 (14); calcar, 6.4; forearm, 67; thumb, 28 (24); second digit, 47 (45); third digit, 122; fourth digit, 96; fifth digit, 90; ear from meatus, 15.6; ear from crown, 13; width of ear, 9. Skull: greatest length, 30.6; basal length, 28.4; basilar length, 26.8; median palatal length, 14; breadth of palate between anterior molars, 5.8; zygomatic breadth, 18.6; least interorbital breadth in front of postorbital processes, 7.4; breadth of braincase above roots of zygomatics, 12.6; greatest depth of brain case, 11; occipital depth, 7.4; mandible, 24; maxillary tooth row (exclusive of incisors), 10.4; mandibular tooth row (exclusive of incisors), 11.4.

Genus MACACUS Lacépède.**MACACUS LEONINUS (Blyth).**

1869. *Macacus andamanensis* BARTLET, Land and Water, VIII, p. 57, July 24 (Port Blair).
1869. *Macacus andamanensis* SCLATER, Proc. Zool. Soc. London, p. 467.
1888. *Macacus leoninus* BLANFORD, Fauna of British India, I, p. 18.

The Burmese pig-tailed monkey has been introduced among the Andaman Islands, according to Dobson. By Bartlet, however, it was regarded as indigenous. The former view is probably correct. Dr. Abbott did not meet with the animal.

MACACUS UMBROSUS, new species.

1846. *Macacus cynomolgus* BLYTH, Journ. Asiat. Soc. Bengal, XV, p. 367. (Nicobar Islands).

1869. [*Inuus cynomolgus*] var. a, *Cercoebus carbonarius* ZELEBOR, Reise der österreichischen Fregatte Novara, Zool., I (Wirbelthiere), 1, Mamm., p. 7. (Great Nicobar Island.)

Type.—Adult male (skin and skull), No. 111795, U.S.N.M. Collected on Little Nicobar Island, Nicobars, February 25, 1901, by Dr. W. L. Abbott. Original number, 888.

Characters.—Similar to the *Macacus 'cynomolgus'* of the Malay Peninsula, but much darker and less yellowish in color. General hue of upper parts hair-brown, the hairs with faint pale annulations, but with no trace of tawny.

Color.—Upper parts and outer surface of limbs nearly uniform hair brown, with a faint tinge of drab, the latter becoming more pronounced on sides. About 3 mm. below the tip of each hair is a dull cream buff annulation 3 mm. to 4 mm. in width. These light rings, together with the glossy texture of the hairs, give the fur a changing aspect as viewed in different lights. They are slightly more numerous on crown, nape, buttocks, and posterior surface of thighs than elsewhere. On the crown and nape they are very sharply defined, but on buttocks and thighs they lose their distinctness, at the same time increasing in length. Tail dark drab above, almost black on proximal half, pale drab below. Under parts and inner surface of limbs scantily clothed with pale drab hairs of very silky texture, those bordering mouth distinctly darker than elsewhere.

Skull and teeth.—The skull and teeth so closely resemble those of *Macacus "cynomolgus"* that I can detect no tangible differences.

Measurements.—For external measurements see table, page 790.

Cranial measurements of type: Greatest length (exclusive of incisors), 134 mm.; basal length, 102; basilar length, 96; least palatal length, 57; palatal breadth (between front molars), 25; zygomatic breadth, 90; mastoid breadth, 71; greatest breadth of braincase above roots of zygomata, 61; least breadth of braincase immediately behind orbits, 39; orbital breadth, 67; least distance from orbit to alveolus of inner incisor, 49; greatest depth of braincase (exclusive of sagittal crest), 50; mandible, 97; greatest depth of ramus, 19.6; maxillary tooth row (exclusive of incisors), 44.6; mandibular tooth row (exclusive of incisors), 50; crown of middle upper molar, 8.8 by 9; crown of middle lower molar, 8.2 by 7.4.

Specimens examined.—Eight, from the following islands of the Nicobar group: Great Nicobar, 4; Little Nicobar, 2; Katchal, 2.

Remarks.—The series of eight specimens includes individuals of all ages from half-grown young to aged adults. Throughout the color is

very constant, and no approach is shown to the tawny of *Macacus* "*cynomolgus*."

This monkey was supposed by Zelebor to be the same as *Macacus carbonarius*, an animal from Sumatra, described by F. Cuvier in the *Histoire Naturelle des Mammifères*.¹ That such is not the case is clearly proved by Cuvier's description and figure, both of which refer to an individual of the tawny '*cynomolgus*' type.

Macacus umbrosus has long been known as an inhabitant of the Nicobar Islands. It was recorded by Blyth as long ago as 1846. Blanford suggested that it might have been introduced,² but the reasons for this supposition are not given.

Measurements of eight specimens of Macacus umbrosus.

Number.	Sex.	Total length.	Head and body.	Tail.	Foot.
		<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i>	<i>Mm.</i>
111792.....	Male ad ...	1,040	510	530	135
1117951.....	do	1,085	505	530	145
111796.....	Male	915	470	445	135
111797.....	do	1,025	475	550	155
111801.....	Male ad ...	1,130	525	605	150
111802.....	Male	790	360	430	120
111792.....	Female	830	395	435	120
111799.....	Female ad ..	960	460	500	133

¹Type. Weight, 8 kg.

SUMMARY.

The mammal fauna of the Andaman and Nicobar islands is now known to consist of 35 positively identified species and 4 others whose status is still in doubt.³ Their distribution is shown in the accompanying tabular summary, in which the letter "A" indicates material obtained by Dr. Abbott, the letter "R" a previous record.

On comparing this fauna with that of other islands in the Malay region,⁴ two remarkable features are at once noticeable, the prevalence of bats and rats and the absence of practically all of the characteristic

¹ Vol. V, Pt. 52. October, 1825. Named in table, Vol. VII, p. 2, 1842.

² Fauna of British India, I, Mamm., p. 22, 1888.

³ Two animals of known recent introduction are not included. These are the domestic goat on Barren Island, Andamans, and the buffalo on Kamorta Island, Nicobars. The goats were placed on Barren Island some years ago by the Port Blair authorities and at the time of Dr. Abbotts' visit had increased to several hundred. The buffalo on Kamorta are descendants of individuals left by the Danes when they abandoned their settlement. They are few in numbers, and Dr. Abbott and Mr. Kloss saw only their tracks. A pair of axis deer were placed in a favorable locality on one of the Nicobar Islands by Captain Lewis in 1846 (see Blyth, Journ. Asiat. Soc. Bengal, XV, p. 368), but it is unlikely that the species became established.

⁴ See Miller, Mammals collected by Dr. W. L. Abbott on islands in the South China Sea (Proc. Washington Acad. Sci., II, pp. 203-246, August 20, 1900), and Mammals collected by Dr. W. L. Abbott on the Natuna Islands (Proc. Washington Acad. Sci., III, pp. 111-138, March 26, 1901).

Malayan types, such as ungulates, squirrels, carnivores, and flying-lemurs, which abound on other islands at an equal distance from the mainland. This paucity of mammalian life can not be regarded as due to unfavorable surroundings, since all the natural conditions on both Andamans and Nicobars are perfectly suited to the support of a rich and varied fauna. In only one feature do the Andamans and Nicobars differ from such islands as Sumatra, Java, Borneo, the Natunas, Anambas, and Tambelans; they are surrounded by water of relatively great depth, while the others lie within the 50 fathom line. Doubtless this greater depth of water indicates separation from the mainland during a much longer period of time; and it appears safe to assume, therefore, that the Andamans and Nicobars, contrary to the case with the shallow-water islands, were isolated at a time when the mammals now characteristic of the Malay region did not exist there. As yet no species are known whose origin may be referred to the remote period of this land connection, but that such exist in the unexplored interior of the larger islands, particularly of the Andaman group, is not beyond the limit of possibility. Such mammals as are now known are evidently of very recent origin, as in scarcely an instance has their differentiation progressed further than in the case of members of the same genera found on islands lying in shallow water. The question at once arises, therefore, as to the means by which they have arrived where they now are. Flight from the mainland would readily account for the distribution of the bats; but the presence of the other mammals seems impossible to explain otherwise than through the agency of man. With the single exception of *Tupaia nicobarica*,¹ all are types well known to be closely associated with man throughout the Malayan region. Moreover, the period of time necessary to the development of the peculiarities of the native Andamanese would undoubtedly be ample to allow the formation of any of the species known from either group of islands, since in a biologic sense it has been vastly longer to the smaller, more rapidly breeding animals than to man. The introduction, intentional or otherwise, of a pig, a monkey, a palmcivet, two or three species of rats, a shrew and perhaps also a treeshrew, at about the time when the various islands were peopled by their present human inhabitants, would amply account for the existence of the present mammal fauna with its striking peculiarities.

¹It is worthy of note that this animal differs more conspicuously from its congeners than is the case with any of the other mammals.

Synopsis of the mammal fauna of the Andaman and Nicobar islands.

Name.	Andaman Islands.						Nicobar Islands.									
	South Andaman.	Rutland Island.	Little Andaman.	Henry Lawrence Island.	Little Jolly Boy.	Barren Island.	No island specified.	Car Nicobar.	Tillanchong Island.	Trinkut Island.	Kamorta Island.	Nankauri Island.	Kachal Island.	Little Nicobar.	Great Nicobar.	No island specified.
Dugong dugon							R									
Sus andamanensis	R		RA													
Sus nicobaricus															A	R
Mus musculus	R															
Mus palmarum																R
Mus bowersi?							R									
Mus stoicus				A												
Mus taciturnus	A															
Mus flebilis				A												
Mus andamanensis	RA															
Mus pulliventer						A									A	
Mus atratus										A						
Mus burrus																
Mus burrus								A		A						
Mus burrescens															A	
Mus alexandrinus												A				
Paradoxurus tyleri	RA															
Felis chaus?	R															
Tupaia nicobarica nicobarica																
Tupaia nicobarica surda															RA	
Crocidura nicobarica															A	
Crocidura andamanensis	A														A	
Scotophilus temminckii																
Tylonycteris pachypus							R									R
Pipistrellus tickelli							R									
Pipistrellus tenuis?																R
Pipistrellus camorta											A					
Miniopterus pusillus													R			R
Rhinolophus andamanensis	R															
Hipposideros nicobaricus																
Hipposideros nicobarulae															A	R
Hipposideros murinus?																R
Pteropus nicobaricus	R				R		R	R	A						A	R
Pteropus faunulus																
Pteropus vampyrus							R									R
Cynopterus brachyotis							R									
Cynopterus brachysoma	R															
Cynopterus scherzeri								RA								
Macacus leoninus	R															
Macacus umbrosus													A	A	A	R

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An account of the landing of a party from the East India Company's transport *Earl Kelly* in search of water. Skulls of the Andaman pig mentioned (p. 46) and roughly figured (pl. 1).

ANDERSON, JOHN. Catalogue of Mammalia in the Indian Museum. Calcutta, 1881.

The following mammals recorded from the Andamans and Nicobars:

- Macacus carbonarius* (Nicobars).
- Pteropus nicobaricus* (both groups).
- Cynopterus marginatus* (Andamans).
- Cynopterus scherzeri* (Nicobars).
- Cynopterus brachysoma* (Andamans).
- Rhinolophus andamanensis* (Andamans).
- Phyllorhina* (= *Hipposideros*) *nicobarensis* (Nicobars).
- Phyllorhina* (= *Hipposideros*) *bicolor* (Nicobars).
- Vesperugo* (= *Tylonycteris*) *pachypus* (Andamans).
- Vesperugo* (= *Pipistrellus*) *tickelli* (Andamans).
- Vesperugo* (= *Pipistrellus*) *abramus* (Nicobars).
- Miniopterus pusillus* (both groups).
- Tupaia nicobarica* (Nicobars).

BARTLETT, A. D. Andaman monkey (*Macacus andamanensis*). *Land and Water*, VIII, July 24, 1869, p. 57.

The description is based on an adult female *Macacus leoninus* procured at Port Blair, South Andaman Island.

BLANFORD, W. T. A monograph of the genus *Paradoxurus*. *Proc. Zool. Soc. London*, 1885, pp. 780-808.

The Andaman *Paradoxurus tyllerti* regarded as identical with *P. grayi* (pp. 803, 805).

BLANFORD, W. T. Fauna of British India, I, Mammalia. 1888 (pp. 1-250) and 1891 (pp. 251-617).

The following species are stated to occur on the Andaman and Nicobar islands:

- Macacus leoninus* (Andamans, probably introduced).
- Macacus cynomolgus* (Nicobars).
- Felis chaus?* (Andamans).
- Paradoxurus grayi* (Andamans).
- Tupaia nicobarica* (Nicobars).
- Pteropus nicobaricus* (both groups).
- Pteropus edulis* (both groups).
- Cynopterus scherzeri* (Nicobars).
- Cynopterus brachyotis* (Andamans).
- Cynopterus brachysoma* (Andamans).
- Hipposideros nicobarensis* (Nicobars).
- Rhinolophus andamanensis* (Andamans).
- Miniopterus pusillus* (both groups).
- Pipistrellus tickelli* (Andamans).
- Mus rattus* (Nicobars).
- Mus bowersi* (Andamans).
- Mus musculus* (Andamans).
- Sus andamanensis* (Andamans).

BLYTH, EDWARD. Notes on the fauna of the Nicobar Islands. *Journ. Asiat. Soc. Bengal*, XV, 1846, pp. 367-379.

Contains brief notes on four mammals, *Macacus cynomolgus* (= *umbrosus*), *Pteropus edulis* (= *nicobaricus*), *Cynopterus marginatus*, and *Hipposideros murinus*, specimens of which were procured by Mr. Barbe and Captain Lewis, and also mention of the Nicobar pig, a second species of monkey, and a large squirrel, none of which were taken. It is also remarked (foot note, p. 368), that Captain Lewis turned out a pair of *Cervus axis* in a locality where he believed they would propagate.

BLYTH, EDWARD. Report of Curator, Zoological Department, for May, 1858. *Journ. Asiat. Soc. Bengal*, XXVII, 1858, pp. 267-290.

Contains an account of the specimens procured by a native collector in the employ of the Asiatic Society, who accompanied Dr. G. von Liebig during a visit to the penal settlement at Port Blair. The pig, here for the first time described as *Sus andamanensis*, is the only mammal recorded.

BLYTH, EDWARD. Report of Curator, Zoological Department, for February to May meetings, 1859. *Journ. Asiat. Soc. Bengal*, XXVIII, 1859, pp. 271-298.

Bats occur on South Andaman Island, and also a rat, not of recent introduction, but none have been identified. A mouse, apparently the house mouse of India, has been taken from the stomach of a snake (*Trigonocephalus*) killed at Port Blair. Bones of *Halicore indicus* (= *Dugong dugon*) found in native hut.

BLYTH, EDWARD. Report of Curator, Zoological Department. *Journ. Asiat. Soc. Bengal*, XXIX, 1860, pp. 87-115.

Two collections of "sundries" from Captain Hodge, Port Blair, have increased the known mammal fauna of the Andamans to five species: *Paradoxurus musanga* (= *tylertii*), *Mus andamanensis* (here first described), *Mus manei*, and *Halicore indicus* (pp. 102-104).

BLYTH, EDWARD. The Zoology of the Andaman Islands. Mouat's *Adventures and Researches among the Andaman Islanders*, 1863, appendix, pp. 345-367.

The first attempt to give a complete enumeration of the mammals of both Andamans and Nicobars. The following species mentioned:

- Macacus cynomolgus* (Nicobars).
- Semnopithecus* sp. (The large monkey seen, but not taken, by Captain Lewis.)
- Pteropus nicobaricus* (Nicobars; no flying fox on the Andamans).
- Cynopterus marginatus* (both groups).
- Felis chaus*? (Andamans).
- Paradoxurus musanga* (Andamans).
- Mus andamanensis* (Andamans).
- Mus manei* (Andamans).
- Sus andamanensis* (Andamans and apparently Nicobars also).

DOBSON, G. E. Description of four new species of Malayan Bats. *Journ. Asiat. Soc. Bengal*, XL, Pt. 2, pp. 260-267. September 25, 1871.

Contains original descriptions of *Cynopterus brachysoma* from the Andamans and *Phyllorhina* (= *Hipposideros*) *nicobarensis* from the Nicobars.

DOBSON, G. E. Brief descriptions of five new species of Rhinolophine Bats. *Journ. Asiat. Soc. Bengal*, XLI, Pt. 2, pp. 336-338. December 22, 1872.

Contains original description of *Rhinolophus andamanensis*.

DOBSON, G. E. On the Pteropidae of India and its islands, with descriptions of new or little-known species. *Journ. Asiat. Soc. Bengal*, XLII, Pt. 2, pp. 194-205. September 8, 1873.

Mentions the following species from the Andaman and Nicobar Islands:

- Pteropus nicobaricus* (both groups).
- Cynopterus marginatus* var. *andamanensis* (Andamans).
- Cynopterus scherzeri* (Nicobars).
- Cynopterus brachysoma* (Andamans).

DOBSON, G. E. Monograph of the Asiatic Chiroptera. 1876. Mentions the following species from the Andaman and Nicobar Islands:

- Pteropus nicobaricus* (both groups).
- Cynopterus marginatus* (Andamans).¹
- Cynopterus brachyotis* (Andamans).¹
- Cynopterus scherzeri* (Nicobars).
- Cynopterus brachysoma* (Andamans).
- Rhinolophus andamanensis* (Andamans).
- Phyllorhina* (= *Hipposideros*) *nicobarensis* (Nicobars).
- Phyllorhina* (= *Hipposideros*) *bicolor* (Nicobars).
- Miniopterus pusillus* (Nicobars).
- Vesperugo tickelli* (Andamans).
- Vesperugo pachypus* (Andamans).
- Vesperugo abramus* (Nicobars).

¹Dobson regarded these as varieties of one species. It is not clear whether he intended to record both from the Andamans.

DOBSON, G. E. Catalogue of the Chiroptera in the collection of the British Museum. 1878.

In this work essentially the same bats are mentioned as occurring in the Andamans and Nicobars as are recorded in the Monograph of Asiatic Chiroptera. *Pteropus edulis* (= *vampyrus*) is added and several of the species mentioned in the Monograph are not positively stated to inhabit the islands.

FITZINGER, L. J. Die Ausbeute der österreichischen Naturforscher an Säugethieren und Reptilien während der Weltumsegelung Sr. Majestät Fregatte Novara. *Sitzungsber. der Math.-Naturwissensch. Classe der kais. Acad. der Wissensch., Wien*, XLII (1860), pp. 383–416. 1861.

A nominal list of the mammals and reptiles collected during the voyage of the *Novara*. The following mammals are from the Nicobars:

Cercocebus (= *Macacus*) *carbonarius*.

Pteropus nicobaricus.

Pachysoma (= *Cynopterus*) *giganteum*.

Pachysoma (= *Cynopterus*) *scherzeri*.

Vesperugo (= *Pipistrellus*) *nicobaricus*.

Cladobates (= *Tupaia*) *nicobaricus*.

Mus novaræ.

Mus palmarum.

Of these all but *Pachysoma giganteum*, *Vesperugo nicobaricus*, and *Mus novaræ* were afterwards described by Zelebor.

GRAY, JOHN EDWARD. Catalogue of Carnivorous, Pachydermatous, and Edentate Mammalia in the British Museum. 1869.

Sus andamanensis, pp. 336–337.

GRAY, JOHN EDWARD. Hand-list of the Edentate, Thick-skinned and Ruminant Mammals in the British Museum. 1873.

Sus andamanensis, p. 64.

HUME, ALLAN O. Contributions to the Ornithology of India. The Islands of the Bay of Bengal. *Stray Feathers*, II, 1874, pp. 29–324.

Contains an account of a *Pteropus*, said to be *P. nicobaricus*, observed in large numbers on Little Jolly Boy, Andaman Islands.

SCLATER, P. L. [Notice of a live monkey from Port Blair, Andaman Islands.] *Proc. Zool. Soc. London*, 1869, pp. 467–468.

The live specimen from Port Blair which had been described by Bartlet as *Macacus andamanensis*.

TYTLER, COLONEL. Description of a new species of *Paradoxurus* from the Andaman Islands. *Journ. Asiat. Soc. Bengal*, XXXIII, 1864, p. 188.

Paradoxurus tytlerei.

ZELEBOR, JOHANN. Reise der österreichischen Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859. *Zool.*, I (Wirbelthiere), 1, Mammalia.

The following species are recorded from the Nicobar Islands.

Cercocebus (= *Macacus*) *carbonarius*.

Pachysoma (= *Cynopterus*) *giganteum*.

Pteropus edulis.

Pteropus nicobaricus.

Pachysoma (= *Cynopterus*) *scherzeri*.

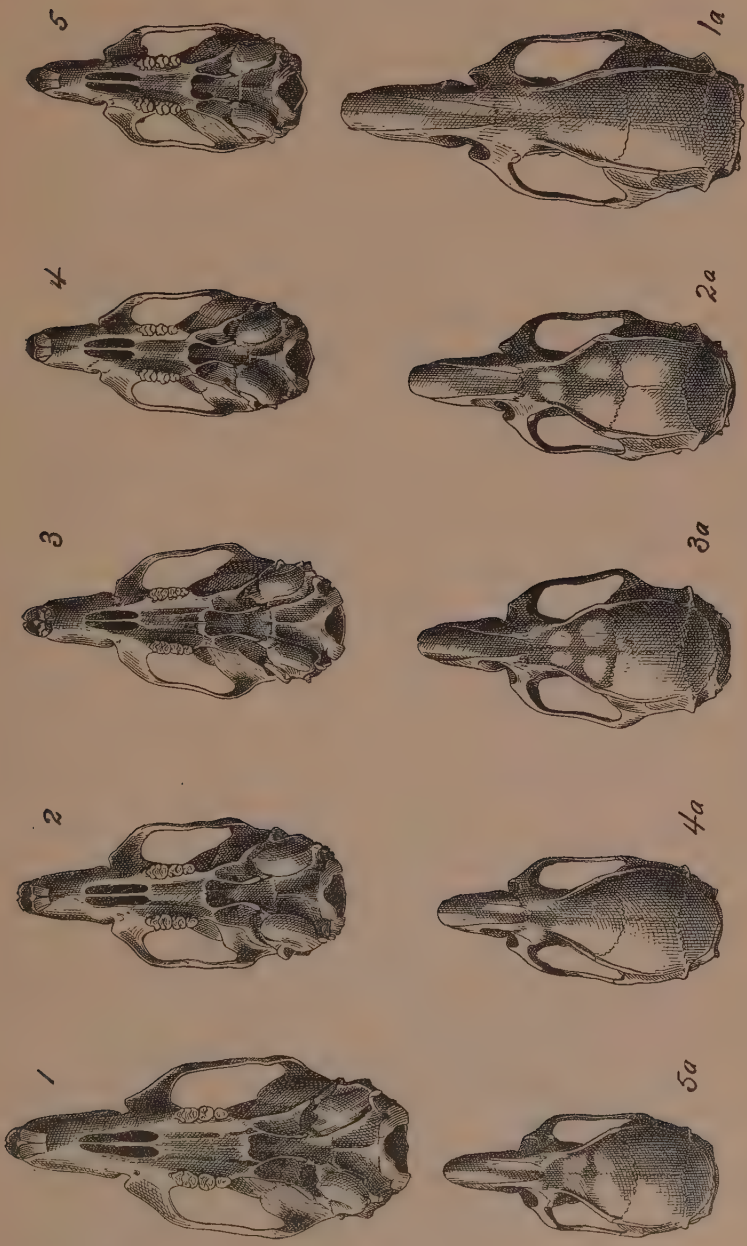
Vesperugo (= *Pipistrellus*) *tenuis*.

Cladobates (= *Tupaia*) *nicobaricus*.

Mus palmarum.



ANDAMAN AND NICOBAR MAMMALS.
1. *Mus stolicus* $\times 1$. 2. *Mus flebilis* $\times 1$. 3. *Mus pulliventer* $\times 1$. 4. *Mus andamanensis* $\times 1$. 5. *Mus atratus* $\times 1$.
6, 6a, 6b. *Crocidura andamanensis* $\times 2\frac{1}{2}$.



ANDAMAN AND NICOBAR MAMMALS.

1, 1a. *Mus stoicus*. 2, 2a. *Mus flebilis*. 3, 3a. *Mus pulliventer*. 4, 4a. *Mus andamanensis*. 5, 5a. *Mus atratus*. (All natural size.)

HENICOPS DOLICHOPUS, A NEW CHILOPOD FROM UTAH.

By RALPH V. CHAMBERLIN,
Of the Latter-Day Saints' College, Salt Lake City.

In a paper on the Lithobiidæ of Salt Lake County, published a short time ago in these Proceedings,¹ the author noted the occurrence in Utah of *Henicops fulvicornis* Meinert, the only form of *Henicops* heretofore reported from North America, although a different species (*Henicops chilensis* Gervais) is known from Chile in South America. The specimens which were at that time, after a partial examination, referred to the species *fulvicornis* have since been restudied, together with more extensive and better material collected during the summer of 1901 from various places in the Wahsatch Mountains, and have been found to consist of two distinct species, of which the more abundant is new to science. *Henicops fulvicornis*, indeed, is represented in these collections by only a few specimens taken at the mouth of Mill Creek Canyon, whereas more than 75 of the new form have been examined. All of the individuals studied, strangely enough, are females; and it may be said that so also Meinert, Latzel, and other European naturalists have failed to find a male of *Henicops* in Europe. The remarks as to habitat, made in the paper mentioned, apply in the main to the new species, an account of which is herewith given.

HENICOPS DOLICHOPUS, new species.

The more essential differences between the two North American species of *Henicops* now known may be tabulated as follows:

- A. Posterior angles of all the dorsal plates straight or rounded.
 - a. Antennæ short, articles 24-29 (mostly 25); anal legs short; length of body 7-11 mm. *fulvicornis* Meinert.
- B. Posterior angles of the 9th, 11th, and 13th dorsal plates strongly produced.
 - a. Antennæ long, articles 39-40; anal legs very long; length of body 11.4-12.6 mm. *dolichopus*, new species.

¹ Proceedings of the U. S. National Museum, XXIV, pp. 21-25

If Stuxberg's subgeneric divisions of *Lithobius* are based upon tenable characters, then the major differences indicated above ought by analogy to rank these two species of *Henicops* in different subgenera.

Description.—Body increasing in width from the head backward to the region of the tenth dorsal plate and then again becoming narrower, moderate. The cephalic plate sparsely hirsute with long and short bristles, the first dorsal plates hirsute subsimilarly to cephalic plate, the last few dorsal plates more sparsely provided with hair, the posterior median scuta subglabrous. The ventrum sparsely hirsute with long bristles, more densely posteriorly. Color yellow to brown, the first and the last dorsal plates usually darker, often reddish brown; head frequently very dark, its anterior and lateral portions reddish or chestnut, at times verging to black, middle and posterior portions paler; ventral plates smoky yellow; legs mostly yellow, brown or somewhat reddish brown toward extremities, the posterior pairs darkest; antennæ yellow to brown, reddish brown or chestnut at base. The ground color in all parts subject to modification by a more or less strong violet or lavender tint apparently from deeper tissue, this being particularly strong in the head and in the anterior and the posterior dorsal plates.

Head a little wider than long (ratio 12:11 or less); posterior margin truncate, as is also the narrower anterior margin, the sides convexly rounded; elevate except lateral borders, which are more or less depressed, flat, or concave above. Antennæ long, densely subpilose; articles 39 or 40, when 40 the ultimate articles proportionately shorter; articles short or very short, excepting the large second, and the more or less cylindrical, distally rounded ultimate article, the first three (or four) articles greatest in diameter, the fourth abruptly smaller, and the ten following subequal to it, very short, the fifteenth again abruptly smaller, those succeeding it gradually decreasing in diameter to the end, longer and more freely joined than those preceding. On each side of the head a round, moderately large ocellus at the bottom of a depression on the frontal suture. Prosternal teeth 3-3, small and pale, on each side the two innermost proximate and often elevated together, the outermost being separated by a wider and deeper interval and the prosternal margin beneath it less produced.

The posterior angles of the ninth, eleventh, and thirteenth dorsal plates strongly produced. Dorsal plates convexly arched; each of the larger scuta with five, more or less evident longitudinal sulci, two lateral, parallel one with each side, one median, and two intermediate diverging from each other posteriorly; the two lateral sulci continuous, with a transverse depression or furrow (sometimes double) running parallel with and a little anterior to the posterior margin, corresponding lines often traceable on the head. Ventral plates with one or with two wide and shallow transverse depressions.

Legs hirsute, with long straight bristles; anal pair very long, slender, not at all crassate (female); all feet provided each with three claws, the middle one long and slender.

Coxal pores in one series, round and large; arranged in a rather deep furrow or excavation on the posterior side of the coxa, so that they are mostly invisible in the supine position of the animal; 3, 3, 3, 3-4, 5, 5, 4. Genital forceps of the female with the claw long, pointed, and incurved, without any trace of lateral lobes; basal spines 2-2 or 2-3, stout, conical, the inner spines smallest, in most bent outward above.

Length of body, 11.4-12.6 mm.; width, 1.5-1.7 mm.; length of antennæ, 5.6-6 mm.; of anal legs, 6-6.5 mm.

*Juvenis*¹—Ground color light brown to yellow, but this mostly hidden by the violet from beneath, the head appearing purple, often very dark; ventral plates likewise violet or lavender, the color becoming deeper posteriorly; antennæ light brown or yellow.

Articles of antennæ 31-36. Prosternal teeth 3-3. Coxal pores moderately large, the groove in which situated more shallow than in mature form, 2, 2, 2, 2-3, 3, 3, 3. Genital forceps short; claw short and pale; basal spines 2-2, short conical points.

Length of body, 8-8.4 mm.; width, 1.2 mm.; length of antennæ, 4.6 mm.; of anal legs, 4-4.2 mm.

Immaturus.—Color yellowish brown, the head darker; legs and antennæ smoky white.

In the one specimen of this form obtained the 40 articles of the antennæ are already present, very short, the individual being doubtless exceptional. Prosternal teeth not yet evident. Ocelli distinct, considerably larger than in pullus. External genital appendages not yet formed, but visible as incipient buds. Coxal pores 2, 2, 2, 2, porigerous surface scarcely depressed.

Length of body, 5.5 mm.; width, .65 mm.; length of antennæ, 2.5 mm.; of anal legs, 1 mm.

Pullus.—The pulli obtained are of the stage possessing 12 pairs of developed legs, with the remaining pairs appearing as buds. Dorsal plates 12.

Color yellow; antennæ and legs white. Articles of the antennæ 25-32. Ocelli small, colorless. Coxal pores 1, 1, 1, 1, very small.

Length of body 3-4.6 mm.; length of antennæ 2.1-2.5 mm.

Type.—U.S.N.M., No. 787.

Habitat.—Wahsatch Mountains at elevations from 6,000 to 10,000 feet above sea level. Under wood and stones along streams, about springs, and near melting snow, but also not uncommon under the fallen logs of the pine and quaking aspen forests away from running

¹ The terms indicating immature stages of growth are here used as by Latzel. See *Die Myriapoden der Ost.-Ung. Monarchie*, Pt. 1, pp. 37, 38.

water. Specimens were obtained at many points between Farmington Canyon, Davis County, and Spanish Fork Canyon, Utah County, south of which place none was found.

The author also has in his collection a number of specimens of *Hemiacops* taken by his brother, Prof. W. H. Chamberlin, at the head of Chalk Creek, in the Uintah Mountains, which prove to belong to the same species as those from the Wahsatch. It is, consequently, very probable that the range of this species is carried eastward by the Uintahs into the Rockies.

A REVIEW OF THE LARKS OF THE GENUS *OTOCORIS*.

By **HARRY C. OBERHOLSER**,
Assistant Ornithologist, Department of Agriculture.

Among all the many and various groups of birds which have in recent years of ornithological activity become noted as conspicuous exponents of extreme geographical variation, none is more prominent than that comprising the horned larks. Possessed of an extremely plastic organization, and subjected to comparatively stationary conditions, these birds have responded to environment and other influential circumstances to a degree that has invested them with peculiar interest and instructiveness for the philosophical student, and at the same time has rendered their classification and identification a source of despair to the systematist. But the manner and degree of variation must be properly set forth before the full significance of these facts can be appreciated, and this should be the ultimate aim of systematic research—not, as seems only too often to be so considered, the mere facilitation of the determination of specimens in the cabinet.

With the few exceptions of cases in which the forms appear to be trenchantly defined, all of the horned larks, both Old World and American, grade insensibly into some other, often into several, so that with all the connecting links represented it frequently becomes a matter of considerable difficulty satisfactorily to segregate the forms represented by such series. If, however, it be remembered what an adaptability to both climate and physiographical conditions these birds possess, the fact of their great geographical variation seems hardly so surprising. They are found from the shores of the Arctic Ocean to the heart of the Tropics; from the level of the sea to the summits of lofty mountains, and from regions of excessive rainfall to the most arid deserts. They are preeminently birds of the open country, rarely, if ever, venturing into the depths of the forests, for the grassy savannas, cultivated fields, country roadsides, the bare or brushy deserts, and the stony mountain slopes are habitats much more to their taste. The largely graminivorous nature of their food has undoubtedly much to do with their being so nearly resident, a condition that seems to exist quite generally throughout the genus. The northern forms,

however, are, at least to a considerable degree, migratory, but among many of the others, while there exists a greater or less individual inclination to wander during the winter, there is no regular nor well-defined movement.

Altitude, unaccompanied by other influences, appears to have little or no potency as a modifying agency, for the present material shows that, notwithstanding some statements to the contrary, there is no appreciable difference either in size or color between mountain birds and those from adjacent lowlands. Neither are the boundaries of the currently accepted faunal areas, except in very restricted application, of any value in circumscribing the ranges of the horned larks. In fact these birds, in many details of geographical distribution, seem to be quite anomalous. Why, for instance, is the form inhabiting the San Joaquin Valley, California, not the same as the one in the Sacramento Valley, as the similar conditions of climate and topography would lead us to expect?

Quite interesting, however, is a comparison of the distribution of the American horned larks with that of the song sparrows, a group of approximately equal dispersion and similar plasticity. There are of each of these groups twenty-one recognizable races in Mexico and North America.¹ Of these, four song sparrows and five horned larks are, during the breeding season, largely or entirely confined to Mexico; twelve of each are similarly peculiar to the United States; while five song sparrows and four horned larks are wholly or mainly British American and Alaskan.² It should be borne in mind that in Mexico and the United States the song sparrows are not quite so widely dispersed as the horned larks; that in British America and Alaska the horned larks appear to be entirely absent from the area in which the greatest differentiation occurs among the northern song sparrows—the Pacific coast south of Bering Sea. Although corresponding thus fairly well in general distribution, there is of course considerable divergence in minor details. Particularly in the arid regions there seems to be a marked tendency among the horned larks toward strong differentiation within very limited geographical areas, so that the degree of difference is no criterion at all for extent of range.

One peculiarity of widely dispersed types, the reduplication of forms in far separated localities, seems to be carried to the extreme among the horned larks—the American forms at least. The original case was mentioned by Dr. Dwight,³ but the present investigation has revealed at least five others in which the resultant bird is more like some distant race than any of those whose range is contiguous or nearest.

¹In this estimate no account is taken of *Melospiza c. juddi*, as it is not a tenable subspecies.

²Since the above was written two additional races of song sparrows have been described, both from the Pacific coast of the United States.

³Auk, VII, April, 1890, pp. 139, 144.

These cases are severally treated under their proper headings. That such a condition is brought about by the simple intergradation of two or more forms appears to be sometimes undoubtedly so; but this does not in every instance furnish a solution, and parallel evolution under peculiar environmental conditions presents a more tenable hypothesis.

From this feature of the group it may readily be surmised that the identification of specimens without regard to geography is, to say the least, liable to be difficult. Among the song sparrows the characters of the various races, though sometimes slight, are quite uniform and constant; but in the horned larks the problem is often exceedingly complicated by reason of sexual, seasonal, and local differences, together with excessive individual variation. Various more or less perfect intermediates are very perplexing, and no means of determination can possibly be of value except the actual comparison of specimens, coupled with an accurate knowledge of the relative value of the proper differential characters. Satisfactorily to present such information in printed diagnoses is manifestly out of the question, for characters that will serve to identify even typical examples of some of the more closely allied forms are frequently almost impossible to express intelligibly on paper. Generally speaking, the females of the various races are distinguished from each other by characters quite similar to those of the males, when due allowance has been made for sexual differences, so that one diagnosis will answer for both. Except in cases of very sharply defined forms the young birds in first plumage are not certainly distinguishable, owing to the great range of individual variation.

As Dr. Dwight has already stated,¹ the horned larks molt but once a year. This takes place usually about August, and thereafter, until into the winter, the birds continue in the blended plumage thus assumed, the upper surface more or less uniform, the yellow bright and deep, the black areas obscured by paler, and the breast often much streaked with dusky. Through the wearing away of the tips to the feathers the whole aspect of the bird becomes changed by spring or summer—the back becomes darker, the colors of the upper parts more sharply contrasted, the yellow fades perceptibly, the black areas become unclouded, and the breast loses its streaking.

Although the aggregate amount of material (2,150 specimens) reviewed in the course of the present investigation has been but slightly greater than that at Dr. Dwight's disposal when he treated the North American forms, yet a great deal of that now available consists of breeding specimens not examined by him, and has of course been indispensable to the proper understanding of the various races now recognized. Unfortunately, only a comparatively small number of Old World birds has been examined, though all but four

¹ Auk, VII, April, 1890, p. 139.

forms are represented, and there are undoubtedly several additional races in Asia yet to be elucidated, to which may apply some of the names here, through lack of material, relegated to synonymy.

As in many other groups, there are cases in the horned larks where the type specimen of a described form does not represent the extreme development, and in fact is even an intermediate. Our treatment of all such cases is to refer the type to the form it most closely approaches, specimens from the region in which is shown the greatest degree of difference being arbitrarily considered as typical in such comparisons. Although the horned larks permit of almost infinite division, and the number of American races here admitted might easily be doubled, it has not been deemed advisable formally to separate any that do not present characters at least as good as those of forms heretofore current.

In the systematic treatment which follows there are recognized altogether 36 forms of *Otocoris*, of which all but 6 have subspecific rank, while 2 of the 6 may ultimately have to be reduced to this position. Of the total number 22 are from the American continent, the remaining 14 belonging to the Old World. They are here placed in what seems to be their natural relationship, but it is manifest that in a group like the horned larks, in which a form may be equally related to several others, any entirely satisfactory linear sequence is entirely out of the question. Equally difficult is the preparation of a satisfactory key, and although the one here presented has been prepared with care, it is confessedly but little more than a tabular exposition of the more salient characters. On the accompanying maps the lines have been drawn to indicate as closely as possible the distribution of the various forms, but in many cases where the exact limits of range are unknown the probable extent is of course subject to revision.

The more important of the recent articles on the genus *Otocoris* are as follows:

FINSCH, *Otocoris*, Abhandl. Nat. Ver. zu Bremen, 1870, pp. 341-352.

DRESSER, Genus *Otocorys*, in Birds of Europe, IV, 1874, pp. 385-402.

DUBOIS, Remarques sur les Alouettes du Genre *Otocorys*, Bulletin du Musée Royal d'Histoire Naturelle de Belgique, III, 1884, pp. 223-230.

HEENSHAW, The Shore Larks of the United States and Adjacent Territory, Auk, I, July, 1884, pp. 254-268.

RIDGWAY, Genus *Otocoris* Bonaparte, in Manual of North American Birds, 1st ed., 1887, pp. 347-349, pl. xcvi, fig. 2.

DWIGHT, The Horned Larks of North America, Auk, VII, April, 1890, pp. 138-158, map.

SHARPE, *Otocorys*, in Catalogue of the Birds in the British Museum, XIII, 1890, pp. 528-550; 670-671.

RIDGWAY, Genus *Otocoris* Bonaparte, in Manual of North American Birds, 2d ed., 1896, pp. 347-349; 599, pl. xcvi, fig. 2.

The results embodied in the present revision have been based primarily on the collection of the U. S. National Museum, including that

of the Biological Survey, and to the authorities having these in charge the writer would express his obligations. He is furthermore indebted to the authorities of the American Museum of Natural History and the Academy of Natural Sciences of Philadelphia, who, through Dr. J. A. Allen and Mr. Witmer Stone, respectively, have made possible the examination of much valuable material. Mr. Robert Ridgway and Dr. Charles W. Richmond have been particularly courteous and helpful throughout the entire time covered by this paper's preparation; while the following other gentlemen the writer wishes to thank for their kindness in loaning specimens: Mr. William Brewster, Dr. Louis B. Bishop, and Dr. Jonathan Dwight, jr.

Genus *OTOCORIS* Bonaparte.

Eremophila BOIE, Isis, 1828, p. 322 (not *Eremophilus* Humboldt, 1811).

Phileremos BREHM, Handb. Vög. Deutschl., 1831, p. 312 (not *Phileremus* Latreille, 1809).

Brachonyx LESSON, Compl. de Buffon, VIII, 1837, p. 126 (part,¹ not of Schönnhen, 1826).

Otocoris BONAPARTE, Nuovi Ann. Sci. Nat. Bologna, II, 1838, p. 407 (type, *Alauda cornuta* Wilson = *Otocoris alpestris* (Linnaeus)).

Phylamnus GRAY, List Genera Birds, 1840, p. 47.

Otocornis RÜPPELL, Syst. Uebers. Vög. Nord-Ost-Afr., 1845, p. 78.

Otocorys CABANIS, Mus. Hein., I, 1851, p. 121.

Otocoryx LICHTENSTEIN, Nomencl. Av. Mus. Berol., 1854, p. 38.

Chars. gen.—Bill short, stout, somewhat conoid, shorter than middle toe with claw; nostrils circular, completely covered by dense tufts of antrorse feathers; primaries apparently but nine, there being no visible spurious tenth (outer) primary; inner secondaries somewhat lengthened; tail moderate, nearly square; head not crested but furnished on each side with a curious, narrow, elongated feather tuft, analogous to those of some owls; feet typically alaudine; coloration mixed brown, rufous, cinnamon, pinkish, yellow, white, and black the jugulum always black.

Geographical range.—Nearly all of North America and Mexico; United States of Colombia (Bogota); almost the whole of Europe and Asia; northern Africa; Caffraria.

ANALYTICAL KEY TO THE SPECIES AND SUBSPECIES OF *OTOCORIS*, BASED ON ADULT MALES IN BREEDING PLUMAGE.

- I. Chin and upper throat black *berlepschi* (p. 879).
- II. Chin and upper throat not black.
 - 1. Black of jugulum not separated from that of ear-coverts.
 - A. Wing averaging under 115 mm *bicornis* (p. 878).
 - B. Wing averaging over 115 mm.
 - a. Upper parts more grayish.
 - b. Lighter above *penicillata* (p. 874).
 - b. Darker above *balcanica* (p. 876).

¹ Lesson's genus included both *Brachonyx* of Swainson and *Phileremos* Brehm, as is shown by his synonymy and the species he treats.

- a'. Upper parts more ochraceous.
 - b. Paler, more ochraceous above *diluta* (p. 877).
 - b'. Darker, more brownish above *oreodrama* (p. 876).
- 2. Black of jugulum separated from black ear-coverts by a white or yellow interspace.
- A. Throat always white.
- a. Wing averaging over 115 mm.
 - b. Wing averaging under 120 mm. *elwesi* (p. 868).
 - b'. Wing averaging over 120 mm.
 - c. Back darker, sharply contrasted with nape *longirostris* (p. 867).
 - c'. Back paler, not sharply contrasted with nape.
 - d. Upper surface darker, more rufescent *perissa* (p. 869).
 - d'. Upper surface paler, more buffy *argalea* (p. 871).
- a'. Wing averaging under 115 mm.
- b. Back heavily streaked with dark brown *arcticola* (p. 816).
 - b'. Back not heavily streaked with dark brown.
 - c. More ochraceous above; wing over 105 mm *sibirica* (p. 872).
 - c'. More rufescent above; wing under 105 mm *bilopha* (p. 873).
- B. Throat usually yellow or yellowish.
- a. Wing averaging over 109 mm.
 - b. Back paler; horns long *atlas* (p. 866).
 - b'. Back darker; horns of moderate length.
 - c. Eyebrow white; throat pale yellow *hoyti* (p. 812).
 - c'. Eyebrow yellow; throat rich yellow *alpestris* (p. 807).
- a'. Wing averaging under 109 mm.
- b. Wing averaging under 100 mm.
 - c. Nape not decidedly rufescent.
 - d. Back dark grayish brown *giraudi* (p. 831).
 - d'. Back dark ochraceous brown *diaphora* (p. 807).
 - c'. Nape decidedly rufescent.
 - d. Back not sharply contrasted with nape.
 - e. Larger; nape more reddish *rubea* (p. 851).
 - e'. Smaller; nape more vinaceous *oaxacæ* (p. 854).
 - d'. Back sharply contrasted with nape.
 - e. Back brownish.
 - f. Paler, nape more cinnameous *ammophila* (p. 849).
 - f'. Darker, nape more vinaceous *actia* (p. 845).
 - e'. Back blackish.
 - f. Wing averaging under 95 mm *peregrina* (p. 841).
 - f'. Wing averaging over 95 mm.
 - g. Nape darker; no yellow below
 - black jugular crescent *insularis* (p. 839).
 - g'. Nape lighter; yellow extending
 - below black jugular crescent *strigata* (p. 837).
 - b'. Wing averaging over 100 mm.
 - c. Back little if any darker than nape, slightly or not at all streaked with blackish or dark brown.
 - d. Wing over 105 mm *occidentalis* (p. 855).
 - d'. Wing under 105 mm.
 - e. Nape and occiput more pinkish.
 - f. Upper parts much paler *leucansiptila* (p. 864).
 - f'. Upper parts much darker *aphrasia* (p. 860).
 - e'. Nape and occiput more cinnameous.
 - f. Back reddish cinnamon *adusta* (p. 858).
 - f'. Back pale ochraceous brown *pallida* (p. 863).

- c'. Back decidedly darker than nape, conspicuously streaked with blackish or dark brown.
- d. Upper parts paler.
- e. More grayish above *enthymia* (p. 817).
- e'. More ochraceous above *leucolema* (p. 820).
- d'. Upper parts darker.
- e. Wing averaging over 105 mm. *flava* (p. 810).
- e'. Wing averaging under 105 mm.
- f. Nape cinnamomeous. *ammophila* (p. 849).
- f'. Nape pinkish.
- g. Back more blackish *merrilli* (p. 833).
- g'. Back more brownish.
- h. Nape paler; eyebrow white *praticola* (p. 825).
- h'. Nape darker; eyebrow yellowish. *chrysolæma* (p. 842).

OTOCORIS ALPESTRIS ALPESTRIS (Linnæus).

Alauda alpestris LINNÆUS, Syst. Nat., 10th ed., I, 1758, p. 166.

Otocoris alpestris BONAPARTE, Iconogr. Faun. Ital. Ucc., 1841, p. 5.

Alauda cornuta WILSON, Amer. Orn., I, 1808, p. 87.

Otocorys alpestris HENSHAW, Auk, I, July, 1884, p. 257 (part).

Otocoris alpestris DWIGHT, Auk, VII, April, 1890, p. 141 (part).—RIDGWAY, Man. N. Am. Birds, 2d ed., 1896, p. 348 (part).

Chars. sp.—Size large; colors above dark; throat and eyebrow deep yellow.

Measurements (15 males).—Wing, 108–113 (average, 111.5) mm.; tail, 66.5–75 (average, 71.8) mm.; exposed culmen, 11–13 (average, 12.2) mm.; tarsus, 22–25 (average, 24) mm.; middle toe, 13–14 (average, 13.5) mm.

Type locality.—Coast of [probably South] Carolina.

Geographical distribution.—In summer, northeastern British America, west to Hudson Bay, from Newfoundland, Labrador and the head of James Bay northward; accidental in Greenland; in winter, west to Manitoba and the Mississippi Valley; south regularly to Illinois, Ohio and the Carolinas, casually to Louisiana and the Bermudas.

Description.—*Adult male in breeding plumage.*—No. 111783, U.S. N.M.; Cloud Hills, Canada Bay, Newfoundland, August 2, 1887; F. A. Lucas and W. Palmer. —Upper parts warm sepia brown, darkest on rump, the feathers everywhere edged with pale brown; wings and middle pair of tail feathers the same; middle of crown, occiput, nape, bend of wing and upper tail-coverts cinnamomeous with a pinkish tinge; fore crown, cheeks and jugular crescent black; forehead, superciliary stripe, auriculars and throat primrose yellow; rest of under surface white, the sides tinged with brownish.

Adult female in breeding plumage.—No. 7429, U.S. N.M.; Cleveland, Ohio, April 1, 1851; J. P. Kirtland.—Resembling the adult male at same season, but colors generally duller; back darker with lighter edgings to the feathers; black of crown much mixed with

brown; nape cinnamon with little or no pinkish tinge, and extensively obscured by brownish; yellow of throat and head paler; breast and sides more shaded with brownish.

Adult male in winter plumage.—No. 1924, collection of Dr. A. K. Fisher; Far Rockaway Beach, Long Island, New York, February 7, 1885; A. K. Fisher. —Differs from the summer dress in being somewhat more deeply colored; in the more blended appearance of the upper surface, owing to the dull tips of the feathers; in the more pinkish cast of nape, upper tail-coverts and bend of wing; in the darker shade of yellow on throat and head; and in the conspicuous dusky markings on the breast.

Adult female in winter plumage.—No. 113165, U.S.N.M.: South Duxbury, Massachusetts, November 28, 1886. —Like the summer female, but with all the dark areas more uniform in coloration, due to the blending effect of dull tips to the feathers; yellow rather brighter, and dusky on breast and sides pronounced.

Young in first plumage.—No. 111760, U.S.N.M.. Penguin Island, Newfoundland, July 24, 1887; F. A. Lucas and W. Palmer. Above deep sepia brown, most of the feathers spotted and margined with dull yellowish, buffy or ochraceous; tail much as in the adult; throat and breast dull yellowish, deepest on the latter, and more or less spotted with dusky; rest of under surface yellowish white.

True *alpestris* is distinguished from all the other races by its combination of large size, dark, rufescent upper surface, and deep yellow of throat and eyebrow.

The young are characterized by dark colors combined with a conspicuous yellow suffusion, this latter usually very noticeable below, often even posteriorly.

As was long ago pointed out by Dr. Coues,¹ the subspecific name *alpestris* belongs primarily to the bird from northeastern America, to which it is now for the first time definitely restricted. The *Alanda alpestris* of Linnaeus² was based entirely upon the *Alanda gutturo-flavo* of Catesby,³ which latter, it has been suggested, might, in at least so far as locality is concerned, have been either the race now generally recognized as the typical one—that is, the bird from Labrador and Newfoundland, —or the more southern subspecies *pratensis*. The question thus raised is readily answered by reference to Catesby's own statements as well as his accompanying figure. The latter represents a bird which from its very yellow throat and superciliary stripe and its very brownish upper parts would without hesitation be identified as quite typical of the northern form. The text, in so far as it is diagnostic, reads:

¹Birds of Colorado Valley, 1878, p. 189.

²Syst. Nat., 10th ed., I, 1758, p. 166.

³Nat. Hist. Carolina, I, 1731, p. 32, pl. xxxii.

The Crown of the Head is mixt with black and yellow feathers. Through the Eyes runs a stripe of yellow. From the Angle of the Mouth runs a black stripe, inclining downward; except which, the Throat and Neck are yellow. They frequent the Sand-Hills upon the Sea-shore of Carolina.

These remarks, save, of course, that regarding locality, do not well apply to what we now call *praticola*, which rarely, if ever, has the superciliary distinctly yellow, while the usually very pale yellow of the throat is confined chiefly to the central portion. Furthermore, *praticola*, compared with what we now know as *alpestris*, has the crown very gray, lacking the conspicuous yellow suffusion so characteristic of the latter. Although Catesby states that this species occurs in both Virginia and Carolina, his type undoubtedly came from the latter region, for he says in the introduction that none of his own work was done in Virginia. The only other name requiring consideration in this connection is *Alauda cornuta*,¹ which was, however, evidently founded upon the yellow-browed *alpestris* from the Middle Atlantic States, and is thus an undoubted synonym of the present form.

We know nothing of true *alpestris* during the breeding season, except as a littoral bird, though it possibly occurs at that time in suitable situations over most, if not all, of the region east of Hudson Bay. It is the breeding form at Moose Fort, Ontario, on the southern shore of James Bay, as a specimen in the U. S. National Museum attests, but this is the most southern as well as the most western summer record. The area of its transition to *hoyti* is likewise scarcely more than inferentially known. In winter *alpestris* wanders as far west as Manitoba, and south regularly to Missouri, Ohio, and South Carolina, being apparently most abundant in New England and on the coastal plain of the Atlantic States. There are several records for the Bermuda Islands,² but apparently only one for Greenland.³ It sometimes remains comparatively late in the spring, as is shown by examples from northern Ohio taken on the 1st of April. The single specimen from Wooster, Ohio, several years ago recorded as *alpestris*,⁴ proves upon closer examination to be nearer *praticola*.

As in most of the other races there is much variation in the color of the upper parts, independent of intergradation, some specimens being very reddish, others quite grayish and pinkish. The eyebrow in typical specimens appears always to be yellow, the throat quite uniformly so, paler, of course, in females and breeding males; this color in winter males not infrequently more or less conspicuously tinging the breast below the black jugulum.

¹ Wilson, Amer. Ornith., I, 1808, p. 87.

² Wedderburn, in Jardine's Contr. Orn., 1850, p. 36; Reid, Bulletin U.S.N.M., No. 25, 1884, pp. 177, 178.

³ Reinhardt, Ibis., 1861, p. 8.

⁴ Oberholser, Bull. Ohio Agric. Exper. Sta., Tech. Ser. I, No. 4, 1896, p. 297.

In all, 112 specimens have been examined, taken at the following localities, breeding records being designated by an asterisk:

District of Columbia.—Washington.

Illinois.—Mount Carmel; Maywood, Cook County.

Maine.—Portland.

Maryland.—Marshall Hall, Charles County.

Massachusetts.—South Duxbury; North Truro; Gurnet Beach, Duxbury; Quincy; Chatham.

Minnesota.—Hibbing.

New Hampshire.—Hampton.

New York.—Sing Sing; Shinnecock Bay, Long Island; Far Rockaway Beach, Long Island; Timber Point, Long Island; Long Island City; Montauk Point; Shelter Island; Lockport.

North Carolina.—Raleigh.

Ohio.—Cleveland; Circleville.

Pennsylvania.—Carlisle; Chester County; Philadelphia.

Labrador.—Fort Chimo;* Davis Inlet.*

Manitoba.—Rat Portage.

Newfoundland.—Penguin Island;* Cloud Hills, Canada Bay.*

Northeast Territory.—Resolution Island, Hudson Strait.*

Ontario.—Moose Fort.*

OTOCORIS ALPESTRIS FLAVA (Gmelin).

Alauda flava GMELIN, Syst. Nat., I, 1788, p. 800.

Alauda nivalis PALLAS, Zoog. Rosso-Asiat, I, 1826, p. 519.

Phileremos striatus BREHM, Vogelfang, 1855, p. 122.

Phileremos rufescens BREHM, Vogelfang, 1855, p. 122.

Otocorys alpestris HENSHAW, Auk, I, July, 1884, p. 257 (part).

Otocoris alpestris DWIGHT, Auk, VII, April, 1890, p. 141 (part).—RIDGWAY, Man. N. Am. Birds, 2d ed., 1896, p. 348 (part).

Chars. subsp.—Similar to *Otocoris alpestris alpestris*, but smaller; the nape, rump and bend of wing more pinkish.

Measurements (7 males).—Wing, 105.5–111 (average, 107.9) mm.; tail, 68.5–73.5 (average, 70.6) mm.; exposed culmen, 9–11 (average, 10.1) mm.; tarsus, 21–23 (average, 21.9) mm.; middle toe, 11.5–12.5 (average, 11.9) mm.

Type locality.—Siberia.

Geographical distribution.—In summer the extreme northern parts of Sweden and Norway, northern Russia south in the eastern part to about latitude 55°, northern Siberia south locally to the region about Lake Baikal; in winter south to the British Isles (except Ireland), northern France, central Italy, Turkey, southern Russia, Turkestan and northern China.

Description.—*Adult male in breeding plumage*. No. 111105, U.S.N.M.; Vardö, Norway, June 22, 1877.—Occiput, nape, upper tail-coverts and bend of wing pinkish cinnameous; back, rump,

scapulars and wings sepia, edged with paler; two central tail-feathers like the back, rest of tail brownish black, the two outer feathers with exterior margins and tips of white; lores, cheeks, jugulum and fore part of crown black; throat and remainder of face pale yellow; rest of lower parts dull white; the sides washed with brownish and cinnamonaceous.

Adult female in breeding plumage.—No. 102993, U.S.N.M.; Lisistrov, Russia, May 19, 1876.—Similar to the male, but upper parts more uniform, the crown, nape and back much mixed with brownish or grayish; black of cheeks less pure, and colors generally duller.

Adult male in winter plumage.—No. 77767, U.S.N.M.; Heligoland, November, 1878; H. Gütke.—Similar to summer male, but all the upper parts much obscured by brownish tips to the feathers; throat deeper yellow; sides of the body more heavily washed with brownish; breast heavily spotted with dusky.

Female in winter plumage.—No. 147323, U.S.N.M.; France.—Like the summer dress, but the darker colors everywhere obscured by dull tips to the feathers; yellow areas darker; the breast conspicuously streaked with dusky; everywhere rather more deeply colored.

This race is, of course, most closely allied to true *alpestris*, but differs in its reduced size, this particularly affecting the bill, and in the noticeably more pinkish tinge of the cervix, upper tail-coverts and bend of wing. These differences obtain in the females as well as the males, and are observable in both winter and summer plumages. With regard to the other Old World forms of *Otocoris* no difficulties of identification should exist, since all the races of *penicillata* have the black of the throat united to that of the cheeks; *longirostris* and all its closely related forms have a pure white throat; and *atlas* is much paler above.

Probably lack of material caused both Mr. Henshaw and Dr. Dwight to consider the bird of Europe and Siberia identical with *alpestris* of northeastern America, in which view they have been followed by apparently all subsequent writers. Comparison of a sufficient series makes evident that it is quite as much entitled to recognition as some of the current forms. The very large, pale specimen from southern Russia upon which Mr. Henshaw particularly comments¹ has not been found, and it is possible that there lurks somewhere here a misidentification or mistake of locality. In connection with this Dr. Sharpe's remarks² should be consulted. The earliest and therefore proper name for the Old World form of *alpestris* is *Alauda flava* Gmelin,³ based wholly on the *Ceinture de Prêtre ou Alouette de Sibérie* of

¹Auk, I, July, 1884, p. 257.

²Cat. Birds Brit. Mus., XIII, 1890, p. 544.

³Syst. Nat., I, 1788, p. 800.

Buffon.¹ Other synonyms are *Alauda nivalis* Pallas,² which refers principally to the Siberian bird; *Phileremos striatus* Brehm³ and *Phileremos rufescens* Brehm³ which apply to that of Europe.

A breeding bird from Vardö, Norway, is browner on the interscapular region than are the others in similar plumage, but is not otherwise different. The single Asian specimen, an adult male in perfect spring plumage from the island of Yeso, Japan, seems to be identical with the European examples, in so far as a single example can be relied upon for such determination; but it is, however, apparently rather more grayish above, as well as somewhat larger than any of the birds from Europe, and a good series from Asia might very possibly show the existence of two Old World races of *alpestris*, instead of the single one here recognized.

Thirteen specimens have been examined, representing the localities given below:

England.—Spurn, Yorkshire.

Heligoland.—

Russia.—Krim; Lisistrov.*

Norway.—Vardö.*

France.—[No definite locality given.]

Japan.—Volcano Bay, Yeso.

OTOCORIS ALPESTRIS HOYTI Bishop.

Otocorys alpestris leucolæma HENSHAW, Auk, I, July, 1884, p. 258 (part).

Otocoris alpestris leucolæma DWIGHT, Auk, VII, April, 1890, p. 142 (part).—

RIDGWAY, Man. N. Am. Birds, 2d ed., 1896, p. 348 (part).

Otocoris alpestris hoyti BISHOP, Auk, XIII, April, 1896, p. 130.

Chars. subsp..—Similar to *Otocoris a. flava*, but larger, the throat paler yellow, the eyebrow white.

Measurements (15 males).—Wing, 104–115.5 (average 111.1) mm.; tail, 65.5–75 (average 70.5) mm.; exposed culmen, 10.5–13 (average 11.4) mm.; tarsus, 21–23.5 (average 22.3) mm.; middle toe, 11.5–13 (average 12.5) mm.

Type locality.—Cando, Towner County, North Dakota.

Geographical distribution. In summer, British America from the west shore of Hudson Bay to the valley of the Mackenzie River, north to the Arctic coast, south to Lake Athabasca; in winter southward to Nevada, Utah, Kansas and Michigan, casually to Ohio and New York (Long Island).

Description.—*Adult male in breeding plumage*.—No. 31135, U.S.N.M.; Big Island, Great Slave Lake, British America [summer]; I. Reid.—

¹ Hist. Nat. des Ois., V, 1778, p. 61.

² Zoog. Rosso-Asiat., I, 1826, p. 519.

³ Vogelfang, 1855, p. 122.

Back and wings dark brown, edged with paler; occiput, nape and bend of wing pinkish vinaceous; upper tail-coverts vinaceous cinnamon; middle tail-feathers like those of back, the rest black, the outer pair margined and tipped with white; crown, lores, cheeks and jugular crescent black; forehead, superciliary and sides of throat dull white; center of throat very pale yellowish; remainder of lower parts dull white, the sides washed with brownish.

Adult female in breeding plumage.—No. 43258, U.S.N.M.; Franklin Bay, British America, July 9, 1864; R. MacFarlane.—Similar to to adult male, but back darker with paler edgings to the feathers, imparting a brighter, more mottled appearance; black of head much mixed with brown; nape more cinnamonaceous, and obscured by brownish; under surface duller, the black on jugulum less extensive and the chin paler yellowish.

Adult male in winter plumage.—No. 65884, U.S.N.M.; Souris River, North Dakota, Oct. 1, 1873; E. Coues.—Like the summer dress, but upper parts more blended by brownish tips to the feathers, the black of head much obscured; breast with some dusky spotting.

Adult female in winter plumage.—No. 65882, U.S.N.M.; Rivière de Laes, North Dakota, Sept. 13, 1873; E. Coues.—Plumage above duller and more uniform than in summer, the decided contrasts obscured; superciliary stripe and light areas of neck and throat washed with dusky, the black areas much obscured; throat rather more deeply yellow, breast and sides more heavily tinged with brownish.

Young in first plumage.—No. 51903, U.S.N.M.; Arctic coast east of Fort Anderson, July 3, 1865; R. MacFarlane. Head and back blackish sepia, varied with ochraceous and spotted with buffy white; nape buffy, barred with dark brown; wings and tail fuscous, margined with ochraceous; superciliary stripe buffy, poorly defined; cheeks dull brownish; throat yellowish white; breast buffy, spotted with dull brown; remainder of lower parts dull buffy white, the sides with markings of dull brown.

The most conspicuous character distinguishing *hoyti* from *alpestris* is the restriction and dilution of the yellow on the head and throat. In *hoyti* this color is usually pale and confined to the middle of the throat, the eyebrow being white, while in *alpestris* the throat, forehead and superciliary stripe are deep yellow, this color often suffusing the crown and occiput. The shade of the upper parts in *hoyti* averages rather less ferruginous brown, particularly in the females, but there is so much individual variation in this respect that the character is hardly of much value in identification. From *arcticola* the present form differs in the darker, more rufescent upper parts, and in the generally distinctly yellow throat. There should be no difficulty in

identifying any typical specimens, though of some intermediates it may not be so easy to dispose. In such cases, however, the more yellowish throat, darker back, or the more rufescent shade of nape, upper tail-coverts and bend of wing will serve to determine specimens that should be called *hoyti*.

The young of this form, as might be expected, resemble to a considerable extent the young of *alpestris*, but are somewhat more grayish above, particularly on the head and cervix, and considerably less tinged with yellow below.

This race has heretofore always been included in *leucolæma*, so-called (= *arctica*), but easily admits of intelligent diagnosis if comparison be made with typical specimens. The entire series upon which Dr. Bishop based his differentiation of this form¹ has been available for examination in the present connection. This series consists almost entirely of spring specimens from Towner County, North Dakota, and a large proportion of these are in various degrees intermediate between *hoyti* and *arctica*. The type of *hoyti* is unfortunately one of these intermediate specimens and consequently does not represent what it seems now necessary to consider the typical bird; being, however, in its yellow throat and brownish upper parts without doubt referable to the race inhabiting the great central area of British America, to which consequently this name must be applied. This form breeds at Great Slave Lake and about Fort Resolution, and two May birds from Depot Island, Hudson Bay, are evidently the same. Two young birds in first plumage, from the Arctic Coast east of Fort Anderson should, without much doubt, be also accredited to *hoyti*, for they are much more ochraceous than would be expected in the young of *arctica*. Then, too, a female from Franklin Bay, Northwest Territory, is apparently *hoyti*. How far to the southward the breeding range of *hoyti* must be extended toward that of *leucolæma* and where it meets and mingles with *arctica* are questions which the material now available does not answer.

In winter *hoyti* ranges southward into the Upper Mississippi Valley as far at least as Kansas, but keeps chiefly west of the river, and apparently is not common west of the plains. Camp Floyd, Utah, and Steamboat Valley, Nevada, are the westernmost records. The "large dark birds with white eyebrows and pale yellow chins" mentioned by Dr. Dwight¹ as being "found in winter in the Upper Mississippi Valley" belong, of course, to the present race. An adult male from Long Island City, Long Island, taken March 9, and another from Wooster, Ohio, are not typical *hoyti*, but are so large and have such very pale throats and eyebrows that they can not be called anything else. Although not examined, the specimen from Shelter Island, New

¹ Auk, XIII, April, 1896, p. 130.

York, placed by Dr. Dwight¹ under *leucolama* (= *arctica*) probably belongs also to *hoyti*.

This race generally has a yellow throat, though pale, but examples occasionally occur which lack almost entirely any trace of this color. The eyebrow in typical specimens is nearly always white, though occasionally it, as well as the light area on the sides of the neck, are tinged with yellow. Considerable variation exists in the amount of dark streaking on the back, some birds being very broadly thus marked, others inconspicuously; this difference observable in the breeding season as well as in winter.

It may, perhaps, be well to call attention to an excusable mistake made by Dr. Dwight, chiefly because it undoubtedly contributed to his failure to recognize the present form as distinct from *arctica*. In the U. S. National Museum collection are several breeding birds from Fort Reliance, Northwest Territory, which place Dr. Dwight located at the eastern extremity of Great Slave Lake, whereas it is, or rather was, for the post is now abandoned, on the Yukon River, not far east of the Alaskan boundary. The birds from Fort Reliance, on the Yukon, are typical *arctica*, while those from the region of Great Slave Lake are equally characteristic of *hoyti*; so it may readily be seen that this error of nearly a thousand miles in the location of Fort Reliance very naturally obscured the evidences of geographical variation really existing.

Seventy-nine specimens of this form have been examined, representing the localities given below, breeding records as before being noted by an asterisk:

Iowa.—Sergeant Bluffs.

Kansas.—Fort Riley; Emporia; Marshall.

Michigan.—Grand Rapids.

Minnesota.—Madison.

North Dakota.—Rivière de Laes; Souris River; Towner County.

Nebraska.—Papillion; Platt Center.

Nevada.—Steamboat Valley.

New York.—Long Island City.

Ohio.—Wooster.

Utah.—Camp Floyd.

Alberta.—Calgary.

Assiniboia.—Indian Head.

Northwest Territory.—Fort Resolution;* Arctic coast east of Fort Anderson;* Big Island, Great Slave Lake;* Franklin Bay;* Depot Island;* Fort Chippewyan,* Lake Athabasca;* Grand Rapids; Fort Churchill;* Cape Eskimo.*

Saskatchewan.—St. Louis.

¹ Auk, VII, 1890, p. 143.

OTOCORIS ALPESTRIS ARCTICOLA, new subspecies.

Otocorys alpestris leucolæma HENSHAW, Auk, I, July, 1884, p. 258 (part; not of Coues).

Otocoris alpestris leucolæma DWIGHT, Auk, VII, April, 1890, p. 142 (part).—RIDGWAY, Man. N. Am. Birds, 2d ed., 1896, p. 348 (part).

Chars. subsp..—Resembling *Otocoris a. hoyti*, but upper surface paler and more grayish, the throat pure white.

Measurements (15 males).—Wing, 108.5–114.5 (average, 111.5) mm.; tail, 67.5–74 (average, 70.7) mm.; exposed culmen, 10–12.5 (average, 11.3) mm.; tarsus, 21.5–24 (average, 22.7) mm.; middle toe, 12–13 (average 12.6) mm.

Type locality.—Fort Reliance, Yukon River, British America.

Geographical distribution.—In summer, Alaska (chiefly the interior), with the valley of the Upper Yukon River; in winter, south to Oregon, Utah and Montana.

Description.—*Adult male in breeding plumage*.—Type, No. 78565, U.S.N.M.; Fort Reliance, Yukon River, British America, May 7, 1879; E. W. Nelson. Back and wings fuscous, the feathers edged with paler brown; hind part of crown, occiput, nape, bend of wing and upper tail-coverts pinkish vinaceous; middle pair of tail-feathers like the back; the rest brownish black, the outer ones margined with whitish; fore part of crown, horns, lores, cheeks and jugular crescent black; forehead, superciliary, throat and remainder of lower parts dull white, the sides streaked with brown.

Adult female in breeding plumage.—No. 70869, U.S.N.M.; St. Michael, Alaska, June 1, 1876; Lucien M. Turner. Head, back, scapulars and rump blackish brown, the feathers margined with buffy; nape brownish gray with but a slight tinge of pink, and narrowly streaked with brown; wings fuscous, edged with buffy and ochraceous, the bend of wing with same cinnamonaceous admixture; tail like that of adult male, but more brownish; lores, cheeks and jugulum dull black; forehead, superciliary, throat and rest of lower surface dull white, the sides washed with brownish and streaked with darker.

Adult male in winter plumage.—No. 153227, U.S.N.M.; Osoyos, British Columbia, December 2, 1893; C. De B. Green. Very similar to the summer male, but head and nape much obscured by brownish tips to the feathers, the nape, bend of wing and superior tail-coverts more pinkish; the black areas more or less obscured by paler tips to the feathers; the breast with some dusky streaks.

Adult female in winter plumage.—No. 153228, U.S.N.M.; Okanagan, British Columbia, December 2, 1893; C. De B. Green. Similar to the summer female, but much paler and more grayish, the upper surface decidedly more uniform; the black areas much obscured by grayish tips to the feathers; breast much streaked with dusky and sides more deeply shaded with the same.

This form is one of the best marked of all the races of *Otocoris alpestris*, differing from the typical subspecies in its very much paler upper surface, more pinkish nape, upper tail-coverts and bend of wing, as well as in the pure white of throat and eyebrow. Comparisons with other forms are elsewhere made, so need not be repeated here.

This is the race to which, through misapprehension of the identity of Dr. Coues' type, the name *leucolaema* has, by common consent, been applied. Examination of the rediscovered type, however, proves it to belong to another race, as fully explained under its proper heading, and leaves the present subspecies without a name. So far as definite data are concerned, the breeding range of *arcticola* must be restricted to Alaska and the valley of the Yukon River. How far south it extends, or where it intergrades with *merrilli* does not appear from the specimens at hand. It remains in even southern British Columbia until into May, and a male from Sumas Prairie, British Columbia, possibly represents the form breeding in the mountains not far to the northward of the valley of the Fraser River.

In autumn and winter *arcticola* occurs in the northern United States, principally west of the Rocky Mountains, there taking to a great extent the place of the more eastern *hoysi*. No specimens have been examined from farther east than Fort Shaw, Montana; and the southernmost records are Fort Klamath, Oregon, and Salt Lake City, Utah.

This form is usually without yellow anywhere, though in winter there is not infrequently a faint wash of this color on the throat. The breeding specimens available are quite uniform, with the exception of a male from St. Michael, Alaska, which is noticeably more reddish on the upper parts. Even in winter there seems to be less individual variation than exists in many of the other subspecies.

Of this race 38 specimens have been examined, representing the following localities:

Alaska.—Fort Yukon;* St. Michael.*

Montana.—Chief Mountain Lake: Bozeman; Fort Shaw; Bitter Root Valley.

Oregon.—Fort Klamath.

Utah.—Salt Lake City; Ogden.

Washington.—Oyhut; Walla Walla.

British Columbia.—Chilliwack; Osoyos; Okanagan; Revelstroke; Sumas Prairie; Twin Buttes Mt., Ashnola River.

Northwest Territory.—Fort Reliance, Yukon River.*

Saskatchewan.—St. Louis.

OTOCORIS ALPESTRIS ENTHYMIA, new subspecies.

Chars. subsp.—Similar to *Otocoris a. arcticola*, but decidedly smaller, the upper surface paler, the throat usually yellow.

Measurements (15 males).—Wing, 101–107.5 (average, 104.8) mm.; tail, 67–75 (average, 70.4) mm.; exposed culmen, 10.5–12.5 (average, 11.3) mm.; tarsus, 21–23 (average, 21.8) mm.; middle toe, 11.5–13 (average, 12.1) mm.

Type locality.—St. Louis, Saskatchewan, British America.

Geographical distribution.—In summer, Saskatchewan, Assiniboia, with possibly southwestern Manitoba; also extreme northern North Dakota; in winter south to Colorado and Kansas, sometimes to Utah and even Arizona.

Description.—*Adult male in breeding plumage.* Type, No. 175258 U.S.N.M., St. Louis, Saskatchewan, April 10, 1893, back and wings fuscous brown, broadly margined with pale brownish gray and buffy; bend of wing, occiput and nape pinkish vinaceous; shorter upper tail-coverts pinkish cinnamon; middle tail feathers like the feathers of the back; rest of tail brownish black, the outer pair of feathers edged exteriorly with white; fore part of crown, horns, lores, cheeks and jugulum black; forehead, superciliary stripe, infra-auricular region and sides of throat yellowish white, chin and center of throat pale yellowish; rest of lower surface white, the sides washed with cinnamon and streaked with dark brown.

Adult female in breeding plumage.—No. 1446, collection of Louis B. Bishop; Towner County, North Dakota, April 22, 1895; Louis B. Bishop. Above sepia brown, the feathers with grayish white or buffy white margins which on nape occupy almost the entire width of the feathers, the dark color being reduced to narrow pale shaft markings; owing also to the breadth of these edgings the occiput shows only a few dark brown streaks in comparison with the back, where the dark centers of the feathers are conspicuous; rump and bend of wing cinnamon; wings and central tail-feathers edged with buffy ochraceous, this changing to whitish on the terminal portions of tail and flight feathers; black of the male's head replaced by brownish; superciliary white; throat white, very slightly tinged with yellow; jugular crescent restricted and obscured peripherally by white margins to the feathers; sides and flanks very slightly washed with cinnamon and narrowly streaked with dark brown.

Adult male in winter plumage.—No. 127373, U.S.N.M.; Spearfish, South Dakota, October 8, 1892; L. M. McCormick. Like the summer male, but upper parts more uniform; bend of wing more pinkish; black areas obscured by grayish; breast spotted with dusky; sides more heavily washed with cinnamon.

Adult female in winter plumage.—Similar to the breeding female, but paler, more grayish, and more uniform above, all the black areas much obscured by grayish, the breast marked with dusky.

Young in first plumage.—No. 2046, collection of Louis B. Bishop; Towner County, North Dakota, July 1, 1895; Louis B. Bishop. Upper

parts buffy ochraceous, each feather with a dark brown center and white terminal spot, excepting the upper tail-coverts, which are simply spotted distally with black; middle rectrices dull brown, broadly edged with buffy ochraceous, and tipped with whitish; remainder of tail feathers brownish-black, margined with white; wings fuscous, the lesser and median coverts, the tips of primaries and innermost secondaries edged with whitish, the rest of the wing margined exteriorly with buffy ochraceous; superciliary dull white; sides of head and neck white, mixed with brownish; lower parts dull white, the breast and jugulum washed with ochraceous and spotted with dusky; sides and flanks with scattered dusky markings.

Although most closely allied to *leucolama*, this form, when typical, can be easily distinguished by its paler, much more pinkish and grayish colors above, white eyebrow, and usually very pale yellow throat. Many intermediate examples are exceedingly difficult to determine: in such cases the best characters for identification consist in the paler and more grayish colors of *enthymia*. From *praticola* it differs in much lighter, more grayish coloration; from *arcticola* in decidedly smaller size, very much paler upper surface, together with a yellow throat; from *giraudi* in larger size, conspicuously lighter upper parts, white superciliary and pallid throat.

The young of *enthymia*, though varying individually to a considerable extent in the depth and shade of color of the upper surface, still in typical specimens average throughout more grayish than *leucolama*, although some specimens, particularly those from intermediate localities, are almost, if not quite, indistinguishable. Young *enthymia* is so very much paler and more grayish than *praticola*, both on the upper surface and on the chest, that specimens of both are always easily identifiable. It is everywhere very much paler and less brownish than the young of either *hoyti* or *alpestris*, besides entirely lacking the conspicuous suffusion of yellow about the head and throat.

So far as is shown by the specimens at hand, *Otocoris alpestris* *enthymia* occupies, during the breeding season, a rather restricted area in North Dakota, Assiniboia, Saskatchewan, and possibly western Manitoba, filling a gap between the ranges of *praticola*, *hoyti*, and *leucolama*. In North Dakota and extreme eastern Montana it intergrades with *leucolama*. The winter range of *enthymia* includes Kansas and Nebraska, in both of which States it appears to be not very uncommon. A typical example from Fort Keogh, Montana, is a western winter record; while specimens from Santa Clara, Utah, and San Francisco Mountain, Arizona, probably show the extent of its wanderings to the southwest.

A series taken by Dr. Bishop during the breeding season in Towner County, North Dakota, is quite uniformly more brownish above, with more cinnamonaceous nape than birds from farther north, being thus

differentiated toward *leucolæma*. The eyebrow and forehead in all are pure white, which, together with the pale upper surface, impart a general appearance strikingly suggestive of some intermediates between *leucolæma* and the southwest form *aphrasta*, though, of course, upon close inspection seen to be darker. The females of this North Dakota series appear to be less intermediate than the males, having, on the light areas above, very little of the buffy tinge of *leucolæma*. They are also paler and more grayish than the same sex of *praticola*. The throat of typical *enthymia* is usually pale yellow, but even in winter is occasionally pure white.

The writer is indebted to the kindness of Dr. Louis B. Bishop, of New Haven, for the privilege of describing the present race. It is but fair to state that he some time ago noticed its distinctness from the Colorado bird, and had in mind its formal separation; nevertheless he generously waived his claim and placed his material at my disposal.

Sixty-seven specimens have been examined, from the following localities, breeding records being indicated by an asterisk:

Arizona.—San Francisco Mountain.

Colorado.—Loveland.

Kansas.—Pendennis; Ellis.

Montana.—Fort Keogh; Miles City; Fort Union.

Nebraska.—Valentine.

North Dakota.—Dickinson; Cando;* Rock Lake, Towner County.*

South Dakota.—Spearfish.

Utah.—Santa Clara.

Wyoming.—Laramie.

Assiniboia.—Indian Head.*

Saskatchewan.—St. Louis.*

OTOCORIS ALPESTRIS LEUCOLÆMA (Coues).

Eremophila alpestris b. *leucolæma* COUES, Birds Northwest, 1874, p. 38.

Otocoris alpestris leucolæma STEINER, Proc. U. S. Nat. Mus., V, 1882, p. 34.

Otocorys alpestris arenicola HENSHAW, Auk., I, July, 1884, p. 265.

Otocoris alpestris arenicola DWIGHT, Auk., VII, April, 1890, p. 146.—RIDGWAY, Man. N. Am. Birds, 2d ed. 1896, pp. 348-349.

Chars. subsp.—Similar to *Otocoris a. enthymia*, but more ochraceous above, the eyebrow usually yellowish.

Measurements (15 males).—Wing, 101-110 (average, 105.8) mm.; tail, 68-77 (average, 71.5) mm.; exposed culmen, 10-13 (average, 11.5) mm.; tarsus, 20.5-23 (average, 21.8) mm.; middle toe, 11-12 (average, 11.7) mm.

Type locality.—Fort Randall, South Dakota.

Geographical distribution.—In summer, western United States from central Dakota, western Kansas and western Nebraska to Idaho and Nevada, north on the eastern side of the Rocky Mountains to Alberta;

in winter, south to Texas, Chihuahua, Sonora and southeastern California.

Description.—Adult male in breeding plumage.—No. 139817, U.S.N.M., Biological Survey Collection; Loveland, Colorado, July 24, 1895; E. A. Preble. Back, wings and middle pair of tail-feathers fuscous, edged with buffy; rest of tail brownish black, the outer pair of feathers margined with white; occiput, cervix, bend of wing and upper tail-coverts pinkish cinnamon; fore crown, horns, lores, cheeks and jugulum black; superciliary stripe, forehead and auriculars white, the last somewhat grayish; throat yellowish white; rest of lower surface white, the sides and flanks shaded with cinnamon.

Adult female in breeding plumage.—No. 139797, U.S.N.M., Biological Survey Collection; Big Butte, Idaho, July 18, 1890; V. Bailey and B. H. Dutcher. Similar to the adult male, but cervix, bend of wing and upper tail-coverts cinnamon without pinkish tinge, the first narrowly streaked with brownish; black of head replaced by brownish and buffy; tail more brownish; superciliary stripe and auriculars buffy; sides and flanks with dusky streaks.

Adult male in winter plumage.—No. 139790, U.S.N.M., Biological Survey Collection; Burlington, Colorado, November 20, 1894; C. P. Streater. Like the summer male, but upper parts more uniform, the cinnamomeous areas more pinkish, this on occiput and cervix almost hidden by the grayish tips of the feathers; superciliary stripe yellowish; throat deeper yellow; black areas obscured by paler; breast marked with dusky; sides and flanks more deeply colored.

Adult female in winter plumage.—No. 67600, U.S.N.M.; Three Buttes, Montana, August 31, 1874; Dr. E. Coues. Similar to the summer female, but upper parts more uniform and more buffy ochraceous; all the black areas obscured; breast strongly tinged with buff and spotted with pale dusky.

Young in first plumage.—No. 139816, U.S.N.M., Biological Survey Collection; Loveland, Colorado, July 23, 1895; E. A. Preble. Upper parts dull brownish ochraceous, each feather with a subterminal bar of sepia, and a terminal spot or bar of white or buffy; wings and tail fuscous, margined with buffy and ochraceous; superciliary stripe buffy; sides of head grayish brown, spotted with buffy whitish; throat white, spotted with dusky; jugulum buffy ochraceous spotted with dusky; sides and flanks buffy, marked with dusky; remainder of lower surface white.

This form may be distinguished from *praticola* by the markedly more cinnamomeous tint of cervix, upper tail-coverts and bend of wing, as well as by the paler color of the back, where the blackish of *praticola* is replaced by sandy brown. From *arcticola* it differs in reduced size, usually yellow throat, nape more tinged with cinnamomeous, lighter and brownish instead of blackish back; from *giraudi* in larger

size, generally paler throat, together with paler, much more brownish upper surface; from *merrilli* in larger size and lighter, more brownish coloration.

Otocoris alpestris leucolæma in first plumage is hardly to be confounded with the same condition of either *pratensis* or *merrilli*, being so much paler, more ochraceous on both the jugulum and the upper parts; and this pallor will serve to distinguish it from also *alpestris* and *hoyti*. It is much more grayish above and usually paler than *actia*, but some specimens would be difficult to separate without knowing the localities. Compared with *adusta* and *auracea*, young *leucolæma* is, of course, decidedly more grayish on the upper surface.

Ever since Mr. Henshaw published his treatise on the American horned larks¹ the name *leucolæma* Coues² has, by almost all writers except Dr. Coues himself, been applied to the form which breeds in Alaska. How such an identification came to be made is not quite clear, but it has apparently been accepted without question. Speaking of what he considered *leucolæma*, Mr. Henshaw has this to say:³ "It has been supposed to breed along our northern frontier in Montana, etc., and Colorado even has been assigned as its summer habitat. So far as is shown by the specimens at hand, however, it does not spend the summer anywhere within our frontier, all of the summer specimens from Montana, Dakota and Colorado, which have been called *leucolæma*, being referable to the next form. The only region where the specimens at hand absolutely prove that it breeds is Alaska, where it was taken by both Mr. Nelson and Mr. Turner." When this was written the type of *leucolæma* was not accessible, but there were in the United States National Museum specimens taken by Dr. Coues at the same time, at the same place as the type, and which, moreover, bore his identification as "*leucolæma*." Dr. Coues' original description, as well as the remark he makes on the preceding page, where he calls *leucolæma* a "pale race, breeding on dry interior plains of the West," together with the synonymy cited, and his subsequent remarks on the subject in "Birds of the Colorado Valley,"⁴ all apply better to the form for which they were intended than to the Alaskan bird, to which Mr. Henshaw restricted the name. The only circumstance that seems to point toward the correctness of the identification made by Mr. Henshaw is the statement in the original description that *leucolæma* is "not smaller than typical *alpestris*." This is fully explained, however, by the fact that the specimens Dr. Coues had in hand when describing *leucolæma*, and which have been above mentioned as the ones bearing his identification, are of rather exceptional size for the Colorado and Montana race, and really are as large as some examples of *alpestris*. The type of *leucolæma*, which is now in the

¹ Auk, I, July, 1884, pp. 254-268.

² Birds Northwest, 1874, p. 39.

³ Auk, I, 1884, p. 258.

⁴ 1878, pp. 186-190.

United States National Museum, proves beyond a doubt what was already more than surmised—that this name must be used for the *Otocoris* inhabiting Colorado, Wyoming, Montana, and adjacent territory, which Mr. Henshaw described as *arenicola*.¹ The type of *arenicola* came from Denver, Colorado, being apparently of the form breeding at that place, and although inclining somewhat toward the race from Assiniboia is much nearer *leucolæma*. The two additional males from Fort Randall, collected by Dr. Coues on March 8 and 12, 1873, respectively, and mentioned above, are substantially identical with the type, though considerably larger. These three specimens, notwithstanding the late date, possibly do not represent the breeding birds of the region, for they appear more closely to resemble examples from northern Colorado. The breeding birds from western Kansas and Nebraska, eastern Montana, extreme eastern Wyoming, central and western South Dakota are intermediate between *leucolæma* and *enthymia*, though nearer the former, being in color above somewhat more brownish than *enthymia*, this evident both on the nape and back. Some specimens from Dickinson, North Dakota, are essentially similar. The area of inosculation with *praticola* is not illustrated by the material at hand, but it must of necessity be limited, for examples from Pendennis, Kansas; Ellsworth, Sidney, and Alliance, Nebraska, show practically no approach to the eastern race, while *praticola* from Strong, Kansas, is very far from intermediate. Specimens from northwestern Montana approach *merrilli* in the darker upper surface, but most of them appear to be nearer the present form. The same tendency is evident in birds from Big Butte, Idaho, and Elko, Nevada, though to a less extent. A single adult breeding male from Roswell, New Mexico, seems to be typical *leucolæma*, but similar examples from both Alpine and Amarillo, Texas, are somewhat more rufescent above. Birds from central and southwestern Nevada average decidedly smaller and somewhat more grayish on the back than those from central Colorado, showing thus an approach to *ammophila*, while more to the southward in Nevada the tendency seems to be toward *leucansiptila*, since some specimens are almost indistinguishable from those of eastern Colorado and western Kansas, intermediate between *leucolæma* and *enthymia*. The birds examined from Antelope Island, Great Salt Lake, Utah, are conspicuously redder than those from the surrounding region, being thus curiously similar to *occidentalis*, though separated from this form by a wide area.

How far to the northward of the United States the range of *leucolæma* extends can not be definitely determined from the material at present available, but a very typical autumnal specimen from Calgary, Alberta, shows that it reaches at least this latitude; and specimens

¹Auk, I, July, 1884, p. 265.

from Medicine Hat, Assiniboia, also belong to this race. Many of the winter birds from Texas and New Mexico are intermediates between *leucolæma* and *occidentalis*, though occurring with them are typical examples of both these forms. The winter range of *leucolæma* includes also northern Mexico, though the birds found there seem to have come from an area of transition from *leucolæma* to *leucansiptila*.

The eyebrow is frequently, the throat occasionally, without a trace of yellow, but both are sometimes deeply yellow; this color also appearing, though rarely, below the black jugular area, as is the case in a few autumnal specimens from southern Montana. Some winter birds have heavy dusky spotting on the breast, while others lack it almost entirely. In worn plumage the back not infrequently is conspicuously blackish, owing to the abrasion of the pale tips of the feathers. In this condition specimens may be distinguished from *merrilli* by the lighter color of the other portions of the upper surface. A difference among specimens of *leucolæma*, which is purely individual, consists in the occasional reddening of the upper surface, most conspicuously on the nape, rump and bend of the wing to such a degree that the difference between this phase and the normal one is greater than that existing between some of the different races, thus forcibly demonstrating the desirability, and sometimes even necessity, of a series of specimens for the determination of *Otocoris* from any given locality. Then, too, the range of *leucolæma* is so extensive and covers areas of so great physiographic diversity that intermediates between it and the various races with which it intergrades, though still unquestionably to be referred to it, are often far more different from each other than are the examples of some of the recognizable forms, particularly those occupying contiguous areas. This race, more than any other, has also a tendency to develop various slight exceedingly local differences which seem entirely independent of subspecific relationship or intergradation.

Specimens to the number of 560 have been examined, these representing the localities given below, breeding birds being designated by an asterisk:

Arizona.—San Francisco Mountain; White Mountains; Wilcox; Fort Verde.

California.—White Mountains;* McGill Peak; Stockton; Keeler.

Colorado.—Loveland;* Clear Creek;* Cortez; Burlington; Denver;* Arlington; Fort Logan; Colorado Springs;* Ramah (El Paso County);* Aiken's Ranch (El Paso County); Turkey Creek (El Paso County); Pueblo; Fort Garland;* Routt County; Eagle County; Mount Rose;* Summitville.*

Idaho.—Blackfoot;* Montpelier;* Big Butte;* Birch Creek.*

Kansas.—Pendennis;* Garden City; Winona; Ellsworth;* Riley.*

Montana.—Blackfoot;* Miles City; Hillsdale;* Pryor Mountains;* Willow Creek;* Helena;* Pass Creek;* Moreland;* Frenchman's River;* Gallatin River; Gallatin Station; Gallatin County;* Two Forks of Milk River;* Clark's Fork;* Fort Custer;* Chief Mountain; Porcupine River;* Fort Keogh;* Fort Union; Dryhorse Spring; Sunday Creek; Madison River; Three Buttes;* Fort Shaw.

Nebraska.—Valentine;* Sidney;* Omaha; Harrison; Alliance;* Wood River; Havellington.

Nevada.—Arc Dome, Toyabe Mountains;* Monitor Valley, 50 miles north of Belmont;* Elko;* Wadsworth;* Big Smoky Valley, opposite Arc Dome;* Ione Valley;* Cloverdale;* Indian Spring Valley;* Osobb Valley;* Steamboat Valley; Tule Canyon;* Franklin Lake;* Panaca;* Pahrump Valley; Smoky Creek;* Washoe Valley; Truckee Meadows.

New Mexico.—Fort Wingate; Fort Massachusetts; Deming; Silver City; Carlsbad (=Eddy); Albuquerque; Roswell;* Santa Fe; La Plata; Fort Thorn; Aztec.

North Dakota.—Dickinson; Big Bend of Heart River;* Fort Rice.*

Oklahoma.—Beaver River; Fort Reno; Tepee Creek.

South Dakota.—Buffalo Gap;* Rapid City;* Belle Fourche; Fort Randall; Corral Draw, Pine Ridge Indian Reservation;* Spearfish;* Armour;* White;* Sturgis;* Black Hills.

Texas.—Laredo; Washburn;* Comanche County; Henrietta;* El Paso; Del Rio; Sierra Blanca; Cook County; Fort Davis;* Marfa;* Gainesville; Amarillo;* Sherwood;* Marathon;* Alpine;* Dimmitt;* San Angelo.

Utah.—Antelope Island, Great Salt Lake;* Salt Lake City;* Ogden;* Fairfield;* Nephi; Uncompahgre Indian Reservation;* Kelton; Santa Clara; Beaver;* West Weber.

Wyoming.—Laramie; Bridger's Pass;* Green River Basin;* Fetterman;* Fort Bridger;* Cheyenne; Sheridan;* Newcastle;* Gilmer; Clearmont;* Wyoming Mountain,* Laramie Peak.*

Alberta.—Calgary.

Assiniboia.—Medicine Hat.

Chihuahua.—White Water; Chihuahua; San Diego.

Sonora.—Animas Valley (United States and Mexican Boundary Line).

OTOCORIS ALPESTRIS PRATICOLA Henshaw.

Otocorys alpestris praticola HENSHAW, Auk, I, July, 1884, p. 264.

Otocorys alpestris praticola DWIGHT, Auk, VII, April, 1890, p. 144.—RIDGWAY, Man. N. Am. Birds, 2d ed., 1896, p. 348.

Chars. subsp..—Resembling *Otocorys a. leucolæma*, but darker, less ochraceous above, the superciliary stripe usually without yellow.

Measurements (15 males).—Wing, 100–108 (average, 104.2) mm.; tail, 67–73 (average 69.5) mm.; exposed culmen, 10–12 (average, 11.2)

mm.; tarsus, 20.5–22.5 (average, 21.6) mm.; middle toe, 11–12 (average, 11.7) mm.

Type locality.—Richland County, Illinois.

Geographical distribution.—In summer, southern Canada from Manitoba to the north shore of the Gulf of St. Lawrence, together with the northeastern United States from Maine, Long Island and Pennsylvania west to eastern Kansas and Nebraska; in winter, south to the Carolinas, Kentucky and Texas, casually west to Colorado, and even Arizona.

Description.—*Adult male in breeding plumage*.—Type, No. 90763 U.S.N.M.; Richland County, Illinois, May 16, 1883; R. Ridgway.—Center of crown, occiput, nape, superior tail-coverts and bend of wing pinkish vinaceous, rather more cinnamonaceous on the two last; back, wings and two middle tail-feathers fuscous, edged with buffy; rest of tail brownish black, the outer pair of feathers with whitish external margins; fore part of crown, horns, lores, cheeks and jugular crescent black; forehead and superciliary stripe dull white; throat and sides of upper jugulum pale primrose yellow; rest of lower parts white, the sides shaded with cinnamon and streaked with dull brown.

Adult female in breeding plumage.—No. 121861, U.S.N.M.; Green Bay, Wisconsin, June 18, 1890; C. W. Richmond. —Above sepia brown narrowly streaked with buffy, the nape dull buffy ochraceous streaked with fuscous, the rump dull cinnamon; wings fuscous, margined with buffy, and on bend of wing with cinnamon; middle pair of tail-feathers like wings, the rest brownish black, the outer pair edged externally with whitish; forehead and superciliary dull white; lores and cheeks blackish, mixed with brownish; throat pale yellow; black of jugulum less extensive than in the male; remainder of lower surface dull white, the sides cinnamon streaked with dark brown.

Adult male in winter plumage.—No. 150628, U.S.N.M.; Washington, District of Columbia, February 3, 1895; R. S. Matthews.—Similar to the breeding male, but colors above duller, more blended, the pinkish of nape almost entirely obscured; black areas with grayish tips to the feathers; bend of wing more pinkish; yellow of throat deeper; breast much streaked with dusky.

Adult female in winter plumage.—No. 117373, U.S.N.M.; Chester, South Carolina, December 7, 1889; L. M. Loomis.—Like the summer female, but paler and more ochraceous above; black areas much obscured; throat paler yellow, breast heavily marked with dusky; sides more deeply tinged with cinnamonaceous.

Young in first plumage.—No. 162497, U.S.N.M.; Port Clinton, Ohio, July 10, 1893; E. M. Hasbrouck. Above very dark brownish black, anteriorly with streaks, posteriorly bars of ochraceous, and spots of buffy white and ochraceous; wings sepia, margined with buffy white and ochraceous; tail sepia, edged exteriorly with ochraceous

and buffy white; an ill-defined superciliary stripe dull white; throat white with slight yellowish tinge; jugulum and upper breast buff, spotted and streaked with sepia; sides of body buffy, streaked with sepia; rest of under surface white with a faint buffy wash.

Otocoris alpestris praticola resembles *O. a. arcticola* but is considerably smaller; more brownish above, the cervix, upper tail-coverts and bend of wing more cinnameous; the throat pale yellow. From *alpestris*, *praticola* differs in its smaller size, more grayish and pinkish coloration and white eyebrow. It is distinguishable from *hoyti* by smaller size, more grayish and pinkish color above.

The young of *praticola* are very dark, much more so than even *alpestris* or *hoyti*, and are also everywhere much less tinged with yellowish than either. This is of course only the *average* condition, for within the great range of individual variation may be found specimens which very closely approach *hoyti*, both above and below, while the very dark, almost black upper parts of some examples exhibit fully as much individual divergence as do the adults.

This race is quite uniform over its entire range, the chief variations being individual. Breeding specimens from Strong, Kansas, are very dark and very brownish, both on the back and nape, and can be well matched by far eastern examples. Three spring birds from Sallisaw, Indian Territory, together with a winter specimen from Gainesville, Texas, and one from London, Nebraska, incline slightly toward *leucolaema* in the paleness of the anterior upper parts, but they possibly do not represent the breeding birds of their respective localities. A female from Boggy Creek, Manitoba, shows a decided approach to *enthymia* in the paler, less buffy shade of the light portions of the upper surface, as well as in the somewhat more grayish color of the dark areas; and another female from Carberry, Manitoba, is even more decidedly intermediate, although, so far as it is possible to judge from the single specimen, is nearer the present form. Similar remarks apply to an adult male from St. Vincent, northwestern Minnesota. Examples from Elk River, Minnesota, are less deeply brown on the interscapular region than the majority of those from the more eastern States, but aside from this are not conspicuously different. An adult female from Towner County, North Dakota, taken on May 20, 1896, is undoubtedly *praticola*, although taken at what surely should be the breeding season in this, the home of *enthymia*. Dr. Bishop probably advances the correct explanation in suggesting it to be a barren female, as its presence so far from its own breeding grounds seems hardly to be explained on any other hypothesis. The exact transition area between *praticola* and *alpestris* is not now definitely determinable, though inferentially known to be probably somewhat circumscribed, but specimens in all degrees of intergradation occur to cause trouble in identification throughout at least portions of the winter range of

praticola, notably in South Carolina, Ohio and Missouri. The western limit of its winter wanderings is shown by a typical male from Fort Verde, Arizona.

Individuals vary much in the shade and intensity of the color of the nape, rump and bend of the wing, these differences also conspicuous on all the light areas of the upper parts. The eyebrow is usually white, though occasionally tinged with yellow; the throat, on the other hand, is rarely without at least a trace of this color.

Specimens to the number of 410 have been available for examination, these coming from the following localities, breeding records being marked by an asterisk:

Arizona.—Fort Verde.

Colorado.—Denver.

District of Columbia.—Washington.

Illinois.—Chicago; * Calumet; * Richland County; * Mount Carmel; * Riverdale; * West Northfield; * Sugar Creek Prairie; * Waukegan; * Mason County; Jacksonville; Noble.*

Indiana.—Indianapolis; Lake County.*

Indian Territory.—Sallisaw; Boggy River.

Iowa.—Iowa City; Sioux City; * Des Moines; Delaware Township, Polk County; * Johnson County; Decorah.

Kansas.—Big Blue River; * Turkey Creek; * Strong; * Manhattan.*

Kentucky.—Lexington.

Michigan.—Ann Arbor; * Detroit; Cadillac.*

Minnesota.—Fort Snelling; * Elk River; * Zumbrota; Round Lake; Saint Vincent.*

Missouri.—"State of Missouri"; * Carthage.

Nebraska.—London; Omaha; Wood River.

New York. Locust Grove; Lockport; * Syracuse; * Glasco, Ulster County; * Peterboro; * Sacket Harbor; * Moose River, Lewis County; Kenwood, Madison County; * Onedia County.*

North Carolina.—Raleigh.

North Dakota.—Towner County.

Ohio.—Port Clinton; * Wooster.*

Pennsylvania.—Erie; * Tidioute; Chester County; Athens.*

South Carolina.—Chester.

Texas.—San Antonio; Gainesville; Cook County; Dallas.

Virginia.—Arlington.

Wisconsin.—Green Bay; * Dane County; * Milwaukee; * Racine; * Palmyra; * Grand Rapids; Camp Douglas.*

Labrador.—Chateau Bay.*

Manitoba.—Carberry; * Rat Portage; Boggy Creek, Big Plain.

Ontario.—Windsor; Ottawa; * Lorne Park, Peel County; * Kingston; * Bracebridge; Toronto.*

Quebec.—Gatineau Point.*

OTOCORIS ALPESTRIS DIAPHORA, new subspecies.

Chars. subsp.—Similar to *Otocoris a. praticola*, but smaller, the back less blackish, more ochraceous.

Measurements (7 males).—Wing, 96.5–103 (average, 99.4) mm.; tail, 64.5–70.5 (average, 67.5) mm.; exposed culmen, 11–12 (average, 11.3) mm.; tarsus, 21–22.5 (average, 21.7) mm.; middle toe, 11–12 (average, 11.4) mm.

Type locality.—Miquihuana, Tamaulipas, Mexico.

Geographical distribution.—In summer, southern Tamaulipas, Mexico, south to Hidalgo; in winter (casually?) to Oaxaca.

Description.—Type, adult male in breeding plumage, No. 158830, U.S.N.M., Biological Survey Collection; Miquihuana, Tamaulipas, Mexico, June 8, 1898; E. W. Nelson and E. A. Goldman. Back, rump and wings dusky brown, all the feathers margined with paler, the bend of the wing dark vinaceous cinnamon; occiput, cervix and upper tail-coverts dull pinkish vinaceous with a slight cinnamon tinge, the longest tail-coverts brownish; tail brownish black, excepting the middle feathers, which are rather light brown, the outermost pair of rectrices distally margined on exterior webs with dull white; forehead, superciliary stripe and auriculars white; crown, "horns," lores and cheeks black; sides of neck and breast like the cervix; thighs and streaks on sides and flanks pale brownish; chin and throat deep primrose yellow; jugular crescent black; remainder of lower parts white.

Adult female in breeding plumage.—No. 158828, U.S.N.M., Biological Survey Collection; Miquihuana, Tamaulipas, Mexico, June 9, 1898; E. W. Nelson and E. A. Goldman. Upper surface dusky brown, more blackish on the back; the feathers all edged with buffy, this deepest on nape and upper tail-coverts, where it occupies the greater portion of the feathers; tail brownish black, the middle pair of feathers dusky brown, the terminal two-thirds of outer webs of outermost pair margined with white; wings dusky brown, edged with paler, the lesser and median coverts pale cinnamon; superciliary stripe dull white; auriculars and subocular region brownish gray; sides of neck and breast pinkish buff, this color also tinging the sides and flanks, which are slightly streaked with dusky; chin and throat primrose yellow; jugular crescent black, though smaller than in the male; rest of the under surface dull white.

Adult male in winter plumage.—No. 144955, U.S.N.M., Biological Survey Collection; Tamazulapam, Oaxaca, Mexico, November 14, 1894; E. W. Nelson and E. A. Goldman. Like the breeding plumage, but the colors above softer and more blended, the nape more pinkish, though this color is almost entirely obscured by the brownish edgings of the feathers; bend of wing and upper tail-coverts more pinkish; breast somewhat streaked with dusky; forehead and superciliary primrose

yellow instead of almost white; throat of deeper yellow; all the black areas more or less varied by brownish tips to the feathers.

Adult female in winter plumage.—No. 144971, U.S.N.M., Biological Survey Collection; Real del Monte, Hidalgo, Mexico, March 10, 1891; C. P. Streater. Similar to the same sex in breeding dress, but upper surface rendered more uniform by the broad unabraded paler edgings of the feathers; rump and bend of wing darker; forehead, superciliary stripe, and in fact most of the head more or less tinged with yellowish; throat deeper yellow; black of jugulum obscured by grayish tips of the feathers; breast washed and streaked with gray.

Young in first plumage.—No. 158831, U.S.N.M., Biological Survey Collection; Miquihuana, Tamaulipas, Mexico, June 9, 1898; E. W. Nelson and E. A. Goldman. Above dull buffy grayish, every feather with a subterminal black area and a white apical spot, these largest on the back; tail as in the adult; wings sepia, edged with whitish and buffy; auriculars mixed grayish and whitish; lower surface white, the jugulum shaded with buff and obscurely spotted with grayish.

This form is throughout paler than *chrysolæma*, with a more pinkish cervix, besides being considerably smaller. It differs from *aphrasta* in being much less cinnamonaceous above, the back quite blackish, and in sharp contrast to the nape; from *actia* and *ouracæ* in paler, much more pinkish and grayish colors above; from *ammophila* in more grayish back, much more pinkish cervix, upper tail-coverts and bend of wing; from *occidentalis* in smaller size and less rufescent upper surface; from *leucolæma* in smaller size, darker, less ochraceous upper parts and usually brighter yellow throat; from *enthymia* in yellow throat, smaller size, much darker, more brownish upper surface; from *giraudi* in the very much more brownish tone of the upper surface. In fact, *diaphora* seems to be in color most like *praticola*, from which, however, it may be separated by its less blackish back; being, moreover, decidedly smaller.

The young of *diaphora* can, by their very gray upper parts, be easily distinguished from the young of *actia*, *ouracæ*, *adusta*, and *aphrasta*; and from *merrilli* and *praticola* the pale grayish instead of blackish tone of the upper surface almost as widely separates them. They are exceedingly close to *enthymia*, however, as well as to *leucolæma*, though they average somewhat more grayish above than the latter.

The specimens upon which this new form is based are breeding birds from Miquihuana, Tamaulipas, Mexico, and since it seems impossible to reconcile their characters with any of the other races, it becomes necessary to give them a subspecific name. One of the males is uniformly more cinnamonaceous above than the others, thus verging slightly toward the appearance of *aphrasta*; but aside from this there seems to be in this series no individual differences worthy of mention.

Birds from the State of Hidalgo average larger and rather darker, an approach to *chrysolæma*; and though two spring examples from Irolo, Hidalgo, resemble *chrysolæma* very closely, others from the same locality are sufficiently near *diaphora* to indicate the proper reference of all to that form. This race probably does not wander far in winter, and possibly is resident except for an occasional straggler. At least such would appear to be the case, for out of a large series of winter birds from the State of Mexico none are referable here. A November male, however, taken at Tamazulapam, in northern Oaxaca, seems without much doubt to belong to *diaphora*, as it is altogether too pale and too pinkish for any of the other forms of the region.

Fourteen specimens have been examined, from the following localities:

Tamaulipas.—Miquihuana.*

Hidalgo.—Irolo;* Tula;* Pachuca;* Real del Monte.*

Oaxaca.—Tamazulapam.

OTOCORIS ALPESTRIS GIRAUDI Henshaw.

Otocorys alpestris giraudi HENSHAW, Auk, I, July, 1884, p. 266.

Otocorys alpestris giraudi DWIGHT, Auk, VII, April, 1890, p. 145.—RIDGWAY, Man.

N. Am. Birds, 2d ed., 1896, p. 349.

Chars. subsp.—Like *Otocorys a. diaphora*, but smaller, the upper surface decidedly more grayish.

Measurements (15 males).—Wing, 92–102 (average, 96.8) mm.; tail, 56.5–66 (average, 62.2) mm.; exposed culmen, 9.5–11 (average, 10.5) mm.; tarsus, 20.5–22.5 (average, 21.8) mm.; middle toe, 10.5–12 (average, 11.1) mm.

Type locality.—Corpus Christi, Texas.

Geographical distribution.—Coast region of Texas and northeastern Tamaulipas, from Galveston Bay to the mouth of the Rio Grande. Apparently resident.

Description.—*Adult male in breeding plumage*.—No. 128060, U.S.N.M.; Galveston, Texas, April 1, 1891; J. A. Singley.—Back, wings and middle pair of tail-feathers fuscous, edged with buffy grayish; remainder of tail brownish black, the outer pair of feathers margined externally with whitish; occiput, nape, bend of wing and superior tail-coverts pinkish cinnamon; crown, horns, lores, cheeks and jugulum black; forehead, auriculars, superciliary stripe and sides of lower throat yellowish white; chin and throat pale primrose yellow; rest of lower parts white, the breast washed with yellow, the sides shaded with cinnamon and streaked with dark brown.

Adult female in breeding plumage.—No. 128063, U.S.N.M.; Galveston, Texas, March 20, 1891; J. A. Singley.—Very similar to the male, but nape and occiput dull buff, streaked with fuscous; black of head replaced by brown and buffy.

Adult male in winter plumage.—No. 6464, Hoopes Collection, Acad. Nat. Sci. Phila.; Brownsville, Texas, October 18, 1896; F. B. Armstrong.—Upper surface quite uniformly but rather obscurely streaked, the black forehead and pinkish of the nape almost entirely hidden; streaking on chest below the pectoral crescent much more conspicuous than in summer, and largely confluent; all the black areas much obscured by pale tips to the feathers; the entire plumage, except for black or white portions, much more grayish or pinkish than in summer.

Adult female in winter plumage.—No. 6466, Hoopes Collection, Acad. Nat. Sci. Phila.; Brownsville, Texas, October 23, 1896; F. B. Armstrong.—Similar to the summer female, but everywhere more grayish; the streaking above more uniform; the breast below the black marked with broad confluent streaks of dusky; all the colored portions, even the yellow of the throat, much obscured by the grayish tips of the feathers. In this condition the female much resembles the male of like season, although very different in summer, when by wear the distinctive marks of the male become accentuated.

Young in first plumage.—Male, No. 27344, Acad. Nat. Sci. Phila.; Corpus Christi, Texas, June 1, 1891; S. N. Rhoads.—Above buffy ochraceous, the feathers with dark brown centers, and spotted terminally with white or buffy; wings and outer tail feathers margined with whitish; superciliary stripe buffy white; lower surface dull white, the breast shaded with buffy and spotted with dusky.

This race is quite similar to *praticola*, though considerably more grayish, rather smaller, and with the yellow of throat usually deeper and suffusing also the superciliary stripe. In winter plumage the dark streaking on the breast is frequently heavier. It is fully as gray above as *arctica*, but is of course easily distinguishable by its reduced size and yellow of throat and eyebrow. It is so much smaller and more grayish than either *hoyti* or *alpestris* that it does not need special comparison.

The young of this race seem to be, so far as can be judged from the limited material examined, much paler and more grayish than the young of *praticola*. From *leucolaema*, to which they bear more resemblance, they seem to differ in somewhat less ochraceous tone of the upper parts, though doubtless some specimens would prove very nearly if not quite indistinguishable.

So far as actual specimens go, *giraudi* seems to be resident in an isolated area on the coast of southeastern Texas, crossing into Mexico only at the mouth of the Rio Grande. From the breeding area of *leucolaema*, which is geographically the nearest of the northern races, it is separated by a distance of at least 300 miles; but in regions not yet satisfactorily explored it possibly intergrades with *diaphora*, which approaches its range more closely than any other form. This last geographical consideration might be sufficient reason for refusing

giraudi specific rank, even did there not exist internal evidence of its imperfect segregation. Some males are difficult to distinguish from *pratricula*, while the females are occasionally, except for size, just like the corresponding sex of *arctica*. Furthermore, there occur specimens of *giraudi* which can be closely matched by birds from Quincy, California, intermediates between *leucoloma* and *merrilli*.

As above indicated, *Otocoris a. giraudi*, though an excellent subspecies, exhibits considerable individual variation, being sometimes quite brownish above, particularly on the anterior portions. In some specimens all the yellow parts are of a deep shade, while in others the throat is very pale and the superciliary stripe and auriculars almost white. There is frequently no yellow on the breast below the black jugular patch, even in males. The thighs are usually deep buff, tinged or not with clear yellow.

Eighty-two specimens have been examined, these representing the following localities, breeding records marked by an asterisk:

Texas.—Point Isabel *; Brownsville *; Refugio; Galveston *; Padre Island; Corpus Christi *; Nueces County; Rockport; Cameron County *; Matagorda Island; Port Lavaca; Indianola; Refugio County *.

Tamaulipas.—Bagdad.

OTOCORIS ALPESTRIS MERRILLI Dwight.

Otocorys alpestris arenicola HENSHAW, Auk, I, July, 1884, p. 529 (part).

Otocoris alpestris merrilli DWIGHT, Auk, VII, April, 1890, p. 153.—RIDGWAY, Man. N. Am. Birds, 2d ed., 1896, p. 599.

Chars. subsp.—Similar to *Otocoris a. giraudi*, but considerably larger, the back more blackish, the nape darker, more rufescent.

Measurements (15 males).—Wing, 98.5–106 (average, 102.9) mm.; tail, 64–72 (average, 69) mm.; exposed culmen, 10–12.5 (average, 11) mm.; tarsus, 20.5–22.5 (average, 21.6) mm.; middle toe, 11–12 (average, 11.5) mm.

Type locality.—Fort Klamath, Oregon.

Geographical distribution.—In summer, northwestern United States, and southern British Columbia, from northeastern California and northwestern Nevada, northward through Oregon and Washington east of the Cascade Mountains to British Columbia and extreme northern Idaho; in winter south to central California.

Description.—*Adult male in breeding plumage*.—Type, No. 19516, collection of William Brewster; Fort Klamath, Oregon, July 1, 1887; Dr. J. C. Merrill.—Above dull sepia, somewhat streaked with whitish; occiput, nape, bend of wing, sides of neck and breast together with upper tail-coverts pinkish cinnamon, rather paler on the last mentioned; two central tail-feathers light brown; the rest black, the outer ones edged externally with white. Fore part of crown, horns, nasal plumes,

lores, subocular region, fore part of auriculars and jugular crescent black; forehead, superciliary stripe and posterior portion of auriculars pale yellowish, the last tinged with brownish; throat naples yellow; remainder of lower parts dull white.

Adult female in breeding plumage.—No. 19538, collection of William Brewster; Fort Klamath, Oregon, May 23, 1887; Dr. J. C. Merrill.—Above sepia, the feathers with buffy whitish edgings, these most numerous on cervix; crown streaked with pale brown; bend of wing and upper tail-coverts pinkish cinnamon; no black on head, that of the male replaced by brownish; superciliary stripe dull white; throat pale yellow; rest of under surface dull white, the sides tinged with cinnamon and streaked with dark brown.

Adult male in winter plumage.—No. 88358, U.S.N.M.; Fort Walla Walla, Washington, February 4, 1882; C. E. Bendire.—Similar to the breeding male, but upper parts duller, more uniform and more ochraceous in cast, the nape scarcely showing its pinkish color; all black areas somewhat obscured; yellow of throat rather deeper; streaks on breast more conspicuous; sides more heavily washed with brownish.

Adult female in winter plumage.—No. 89560, U.S.N.M.; Fort Klamath, Oregon, October 2, 1882; C. E. Bendire.—Resembling the summer dress of female, but paler, more uniform, and more ochraceous above, all the black areas much obscured; yellow of throat paler; breast and sides more heavily washed with brownish and buffy.

Young in first plumage.—Male, No. 19524, collection of William Brewster; Fort Klamath, Oregon, July 1, 1887; Dr. J. C. Merrill.—Above sepia, spotted, with white, these markings more transverse posteriorly; wings brown, edged with whitish and buffy; tail dark brown, the central feathers paler, all tipped and the outer ones margined externally with white; sides of head sepia mixed with whitish; lower parts white, the breast with markings of dusky.

Notwithstanding its geographical position, the present form is apparently more closely allied to *praticola* than to any of the others. In size it is practically the same and in color it differs only in the darker upper surface—particularly the back, which is more blackish—and in the usually yellow eyebrow. Birds occur, however, principally in areas of inosculation with *leucolæma*, which with difficulty could be distinguished from some examples of *praticola*. Compared with *arctica*, whose range probably meets that of *merrilli* somewhere in British Columbia, the latter is much smaller, darker above, with the throat at least, the eyebrow frequently, tinged with yellow. From both *alpestris* and *hoyti* its lesser size and blackish back furnish easy means of separation.

The young of *merrilli* are not with certainty distinguishable from specimens of *praticola* of the same age. The specimen described by

Dr. Dwight¹ as typical of the young of this race is much more grayish above than any of the others we have examined.

The northernmost records of *merrilli* are Ashcroft and Kamloops, British Columbia, and these specimens are practically identical with the type. To the eastward its range includes northern and western Idaho. An August bird from Post Falls, Idaho, is duller and browner above than typical specimens, yet showing no decided approach to *leucolæma*. Breeding examples from Steens Mountains in southern Oregon have the lighter portions of the upper surface considerably suffused with reddish, and the back is more brownish black than ordinary birds, thus strongly resembling *strigata* in color, though sufficiently different in size. Birds from Fort Harney, Oregon, are quite similar to those from the Steens Mountains. A male from Mountain City, Nevada, shows an approach to *leucolæma* in the color above, but is decidedly *merrilli*. This determines the ranges of these two forms at this point to be less than 100 miles apart, *leucolæma* being the horned lark breeding at Elko. Breeding birds from Fort Crook and Madelin Plains, California, are practically typical *merrilli*.

Summer specimens from the vicinity of Carson and Pyramid Lake, Nevada, are noticeably paler than typical *merrilli*, thus being exceedingly similar to *praticola*, to which form Dr. Dwight has referred the birds from Carson.² The males are practically indistinguishable, either in size or color, from *praticola*, but the females average somewhat paler. This difference is so slight, however, that were the birds from an area contiguous to the region inhabited by *praticola*, they would unhesitatingly be considered as belonging to that race; but geographically situated as they are, practically between the ranges of *leucolæma* and *merrilli*, it seems much more rational to consider them intermediates between these forms, and as such to refer them to the one which they seem more closely to resemble. The only alternatives are to recognize them by name, which does not seem advisable in view of their practical identity with *praticola*, or to call them *praticola*, with explanation of the divided range thus assigned to the latter. Quite similar are a few birds from Quincy, California, though darker above, and with the yellow on head and throat very bright, usually also appearing below the black jugular patch, in one male lightly suffusing the entire lower surface. Very puzzling indeed are three specimens—an adult female in molt, with two young in first plumage—from Summit, Nevada County, California, all taken by Mr. Belding on August 16, 1885. One of the immature birds was identified by Dr. Dwight as *merrilli*; the other he called *strigata*; while the female was considered by him to be an intermediate between *merrilli* and *strigata*. The incongruity of these determinations is at once manifest, for the two young were surely from a nest in that immediate vicinity, while the female, still pos-

¹ Auk, VII, 1890, p. 153.

² Idem, p. 144.

sessing portions of her worn breeding plumage, had evidently reared her brood not far away, and was even not impossibly the parent of these two young. But it is perhaps easier to say what these three birds are not than to determine what they really are. They are altogether too dark for *leucolæma* or *actia*, and therefore can not be referred to either of these forms. The young birds very closely resemble *merrilli*, and are thus altogether too grayish to be *rubea*. The adult female, however, though showing some tendency toward *merrilli* in the pinkish tinge to the upper tail-coverts and bend of the wing, as well as in the rather darker color of the back, is otherwise so rufescent and moreover so small that it seems scarcely to be disposed of satisfactorily by reference to that form. A breeding male from the same vicinity, however, is quite the same as specimens of *strigata* from the coast region of Oregon and Washington; and a sufficient series would undoubtedly prove all the birds from about Lake Tahoe to be of the same kind. We have thus here a curiously complicated condition: True *merrilli* from northeastern California produces, by infusion of *rubea* and *actia* on the summit of the Sierra Nevada in California, a bird apparently just like *strigata*; while over on the east slope of the same range, only a short distance away, by intergradation with *leucolæma*, it becomes indistinguishable from *praticola*.

During the winter *merrilli* ranges southward in California as far as the latitude of San Francisco Bay, and in Nevada probably to at least the central portion of the State.

Specimens vary considerably in the shade of the nape, in the clearness of color on the black dorsal area, as well as in the intensity and distribution of the yellow which sometimes, particularly in winter, is very bright and suffuses the entire head, tinging also even the lower surface posterior to the black jugular area, as in *strigata*.

Ninety-six specimens examined, from the following localities:

California.—Montague;* Vinton, Sierra Valley;* Tule Lake;* Fort Crook;* Mount Shasta; Gridley; Marysville; Stockton; Beber;* Bald Mountain, Shasta County; Madelin Plains;* Enterprise; Quincy; Summit (Donner).*

Idaho.—Post Falls.*

Montana.—Tobacco Plains.*

Nevada.—Mountain City;* Carson;* Washoe Lake;* Pyramid Lake.*

Oregon.—Camp Harney; Wapinitia;* Heppner;* Steens Mountains;* Rock Creek;* Antelope;* Grand Ronde Valley;* Christmas Lake;* Willows Junction;* Barren Valley; Detroit; The Dalles; Fort Klamath.*

Washington.—Spokane Falls;* Fort Walla Walla; Touchet; Sunny-side.*

British Columbia.—Chilliwack; Kamloops;* Osoyoys; Ashcroft;* Sumas Lake.

OTOCORIS ALPESTRIS STRIGATA Henshaw.

Otocorys alpestris strigata HENSHAW, Auk, I, July, 1884, p. 267.

Otocorys alpestris strigata DWIGHT, Auk, VII, April, 1890, p. 151 (part).—RIDGWAY, Man. N. Am. Birds, 2d ed., 1896, p. 349.

Chars. subsp..—Quite similar to *Otocoris a. merrilli*, but smaller; less grayish above and more yellowish below.

Measurements (14 males).—Wing, 96–101 (average, 98) mm.; tail, 61.5–68.5 (average, 65.8) mm.; exposed culmen, 10–12.5 (average, 11.3) mm.; tarsus, 19.5–22 (average, 20.8) mm.; middle toe, 10.5–12.5 (average, 11.4) mm.

Type locality.—Fort Steilacoom, Washington.

Geographical distribution.—In summer the States of Oregon and Washington west of the Cascade Mountains; in winter to eastern Oregon and Washington, south to northern California.

Description.—*Adult male in breeding plumage.*—Type No. 8734 U.S.N.M.; Fort Steilacoom, Washington, April 15, 1856; Dr. George Suckley. Back and scapulars dull black, the feathers edged with buffy and ochraceous, imparting a streaked appearance; occiput and nape deep cinnamon rufous; bend of wing and upper tail-coverts the same but rather paler; two central tail feathers dark brown, edged with paler, the remainder of tail brownish black, the outer pair of feathers margined externally with white; wings fuscous, edged with buffy and ochraceous; forepart of crown, horns, lores, cheeks and jugulum black; forehead, superciliary stripe and throat primrose yellow; sides of body heavily washed with cinnamonaceous, and streaked with brown; rest of lower parts dull white, washed with yellow, most conspicuously on anterior portions.

Adult female in breeding plumage.—No. 8733, U.S.N.M.; Fort Steilacoom, Washington, March 20, 1856; Dr. George Suckley. Very similar to the adult male, but black of head mixed with brownish; occiput and nape cinnamon buff, streaked with dark brown; yellow of under surface paler; breast narrowly streaked with dusky.

Adult male in winter plumage.—No. 139899, U.S.N.M., Biological Survey collection; Colton, Washington, August 24, 1895; A. H. Howell. Similar to the summer plumage, but upper parts duller and more uniform, owing to the brownish tips to the feathers; nape paler cinnamonaceous, but this color almost entirely hidden; crown, cervix and sides of neck with considerable yellowish suffusion; all the black areas obscured by yellowish; yellow of superciliary, throat and lower surface much deeper; sides more washed with brownish; breast with considerable dusky marking.

Adult female in winter plumage.—No. 103587, U.S.N.M.; Albany, Oregon, January 22, 1881; H. W. Henshaw. Similar to the summer dress, but duller and more uniform above, the general effect darker; yellow areas rather more deeply colored; breast heavily marked with dusky.

Young in first plumage.—"♀ juv. (No. 5080, collection of G. S. Miller, Jr., Salem, Marion Co., Oregon, June 29, 1890; Allen Rhodes collector): Plumage of dorsal surface seal brown, the feathers everywhere edged with ochraceous-buff, which color is most conspicuous on the upper tail-coverts, rump, cervix, remiges and wing-coverts; interscapulars, scapulars and some of the tertials and wing-coverts tipped with dirty white; rectrices slightly darker than remiges and general dorsal surface, the outer pair tipped and edged externally with dirty white, the inner pair much suffused with ochraceous-buff; ventral surface pure white; chin and throat slightly marked with dusky; jugulum, sides, and flanks ochraceous-buff, flecked, especially on the jugulum, with obscure brownish; cheeks, lores and forehead mixed brown and whitish."¹

This race differs from *merrilli* in much smaller size, deeper and more extended yellow suffusion below, and in the decidedly more brownish color of the upper parts. In autumn and winter, when *merrilli* is often brownish above and shows sometimes as much yellow below as *strigata*, size is the best means of identification. In color it much resembles *alpestris*, but in summer the back is more blackish, in winter the yellow suffusion is more extensive, while its smaller size will of course distinguish it at all seasons. It differs from *hoyti* as from *alpestris*, with the additional character of a deep yellow eyebrow.

According to Mr. Miller,² the young of this race most closely resemble those of *praticola*, and in fact are apparently the same except for the brighter hue of the buffy portions of the plumage. Compared with the young of *merrilli*, they are said to be considerably more ochraceous.

This form of *Otocoris* occupies, during the breeding season, the narrow strip of country west of the Cascade Mountains in Washington and northern Oregon, reaching farther eastward only through the valley of the Columbia River. There seems to be no evidence to support the inclusion of British Columbia in its range, for all the horned larks from that region examined have proved to be *merrilli*. Breeding specimens from both sides of the Columbia River in the vicinity of The Dalles, Oregon, approach *merrilli*, but are smaller and less grayish than that form, seeming thus, without doubt, referable to the present race. In winter *strigata* moves both east and south—in the former direction as far as eastern Washington and north central Oregon; in the latter apparently as far as San Francisco, California, but specimens taken at this place usually seem more or less intermediate between *strigata* and *actia*, and may have come from the Sierra Nevada near Summit, California.³ Dr. Dwight's statement⁴ that *strigata* is resident seems, however, to require some modification.

¹Miller, Auk, VIII, 1891, p. 314.

²Auk, VIII, 1891, p. 314.

³See page 835, under *O. a. merrilli*.

⁴Auk, VII, 1890, p. 152.

There is much variation in the amount and intensity of the yellow in this race, which color is seemingly seldom, if ever, wholly lacking in either sex. In the males it is usually present to a greater or less degree on the breast, often tinging the remainder of the lower surface in worn as well as unworn plumage. The shade of the nape is also quite variable, even in birds of similar season from the same locality.

Twenty-eight specimens have been examined, from the subjoined localities:

California.—Red Bluff; San Francisco.

Oregon.—Umatilla; The Dalles;* Forest Grove;* Albany; McCoy; Salem;* Corvallis.*

Washington.—South Tacoma;* Colton; Ridgefield;* Fort Steilacoom;* Hillhurst;* Rockland;* North Dalles;* Shoalwater Bay.*

OTOCORIS ALPESTRIS INSULARIS Townsend.

Otocoris alpestris strigata DWIGHT, Auk, VII, April, 1890, p. 151-152 (part).

Otocoris alpestris insularis TOWNSEND, Proc. U. S. Nat. Mus., XIII, 1890, p. 140.—

RIDGWAY, Man. N. Am. Birds, 2d. ed., 1896, p. 599.

Chars. subsp.—Like *Otocoris a. strigata*, but darker, somewhat less ochraceous above, less yellowish on breast and abdomen.

Measurements (15 males).—Wing, 95-101 (average, 97.1) mm.; tail, 60-68 (average, 64.4) mm.; exposed culmen, 10-13 (average, 11.3) mm.; tarsus, 21-23 (average, 22) mm.; middle toe, 11-13 (average, 11.9) mm.

Type locality.—San Clemente Island, California.

Geographical distribution.—The Santa Barbara Islands, California. Apparently resident.

Description.—*Adult male in breeding plumage*.—No. 117652, U.S.N.M.; San Clemente Island, California, May 8, 1888; C. H. Townsend.—Back, wings and two middle tail-feathers sepia, edged with buffy and ochraceous; rest of tail brownish black, the outer pair of feathers margined exteriorly with white; occiput, cervix, bend of wing and upper tail-coverts deep cinnamon rufous; crown, horns, lores, cheeks and jugulum black; forehead, superciliary stripe, auriculars, chin and throat pale yellow; rest of lower surface white, the sides and flanks tinged with cinnameous and streaked with dusky.

Adult female in breeding plumage.—No. 139946, U.S.N.M., Biological Survey Collection; San Miguel Island, California, June 24, 1892; C. P. Streater.—Similar to the male, but cervix, occiput and upper tail-coverts pale cinnamon, the two first streaked with fuscous; bend of wing less deeply and less extensively cinnamon rufous; black of top and sides of head replaced by dark brown mixed with buffy; yellow of throat and head rather paler; breast washed with cinnamon.

Adult male in winter plumage.—No. 134809, U.S.N.M.; San Clemente Island, California, August 28, 1894; Dr. Edgar A. Mearns.—Like the summer male, but upper surface rather paler and more

uniform, owing to the blending effect of light edgings of the feathers; cervix, bend of wing and upper tail-coverts paler and more pinkish; black areas obscured; yellow of head and throat deeper; breast heavily streaked with dusky and cinnamonaceous.

Adult female in winter plumage.—No. 134813, U.S.N.M.; San Clemente Island, California, August 28, 1894; Dr. Edgar A. Mearns.—Similar to the breeding dress, but upper parts paler and more uniform; the yellow of head and throat deeper; the black areas obscured by lighter; the breast tinged with cinnamon and heavily streaked with dusky.

Young in first plumage.—Male, No. 47, collection of F. S. Daggett; Santa Barbara Island, California, May 14, 1897.—Upper parts warm bistre, paler on the head, where spotted with darker brown and with buffy; hind neck much mixed with buffy; back and scapulars spotted terminally with buffy white; rump deep ochraceous, somewhat mixed with dark brown; tail clove brown, excepting the two central feathers, which are lighter and rufescent. Wings broadly edged externally with ochraceous, most of the coverts tipped with whitish. Superciliary stripe and ocular region dull yellowish white; cheeks light grayish brown; jugulum and upper breast dull ochraceous, with spots of dusky; remainder of lower surface dull white with a decided wash of yellowish.

Notwithstanding Dr. Dwight's statement¹ that he could not distinguish the Santa Barbara Islands birds from *strigata*, they constitute an easily recognizable race which, though curiously enough most closely allied to *strigata*, yet differs in the darker color above, particularly on cervix and bend of the wing; in the more grayish tone of the back and scapulars; the absence of yellow on the breast; and the much more conspicuous streaking on this part. All these characters, with the exception of the color of the cervix and bend of wing, are much more striking in autumn and winter than in summer. At the former seasons the yellow suffusion on the occiput and cervix of *strigata* is quite marked, this being an additional point of difference between the two races. From *merrilli* the island bird differs in smaller size and much more reddish coloration; while from *actia* of the adjacent mainland it may be separated by its conspicuously darker coloration throughout.

The young of *insularis*, which appear here to be described for the first time, are, when due allowance has been made for the very considerable range of individual difference, much darker, and, particularly on the wings, somewhat less ochraceous above than the young of *actia*; the breast is usually more dingy, and the remainder of the lower surface is washed with dull yellowish instead of being nearly pure white. Compared with a limited series of the young of *merrilli*, they are

¹Auk, VI, 1890, p. 152.

lighter, more ochraceous on the upper parts as well as across the breast, and on the abdomen dull yellowish or buffy tinged instead of soiled white.

Birds from the islands of San Miguel, Santa Rosa, and Santa Cruz, as compared with those from the more southern islands, appear to average slightly darker above, both on the nape and back, but this difference is too slight and inconstant to be worthy of more than passing notice. These dark birds represent the maximum differentiation of *insularis*, while the birds with rather paler napes and more brownish, less blackish backs, carried to apparently the greatest extreme on Santa Catalina Island, incline toward *actia*, and indicate the mainland origin of this insular form. That *insularis* should have been differentiated toward *strigata* is, however, an interesting case of parallel development. By reason of the evident approach to *actia* from island to island, which would in a continental distribution culminate in complete inosculation, and the noticeable resemblance to *strigata*, it seems advisable to consider *insularis* as a subspecies in spite of its island habitat.

The amount of individual variation in *insularis* is great, even in birds from the same island, and consists chiefly in the shade of the upper parts. The yellow about the head and on the throat varies considerably in its intensity, and not infrequently tinges the breast below the jugular crescent, although, in so far at least as present material indicates, never suffuses the entire lower surface. The feathers of the tibia are often even quite strongly tinged with yellow.

One of the males from San Nicolas Island exhibits a curious malformation of the bill. The maxilla is apparently of normal shape and size, but the mandible is almost twice as long as it should be, besides being curved sharply downward, and considerably deflected to the right.

Seventy-two specimens have been examined, all from the following islands of the Santa Barbara group:

California.—San Clemente Island; * Santa Cruz Island; * San Miguel Island; * Santa Rosa Island; * Santa Barbara Island; * San Nicolas Island; * Santa Catalina Island.*

OTOCORIS ALPESTRIS PEREGRINA (Sclater).

Otocorys peregrina SCLATER, Proc. Zool. Soc. Lond., 1855, p. 110, pl. CH.—SHARPE, Cat. Birds Brit. Mus., XIII, 1890, p. 547.

Otocoris alpestris chrysolarma DWIGHT, Auk, VII, April, 1890, p. 149-150 (part).

Otocorys alpestris var. *peregrina* DUBOIS, Synopsis Avium, Pt. 7, 1901, p. 452.

Chars. subsp.—Similar to *Otocoris a. insularis*, but very much smaller.

Measurements (one male).—Wing, 92; tail, 63; exposed culmen, 10.5; tarsus, 21.5; middle toe, 11.5 mm.

Type locality.—Bogota, Colombia.

Geographical distribution.—Vicinity of Bogota, Colombia. Evidently resident.

Description.—*Adult male in winter plumage.*—No. 24939, U.S.N.M.; Bogota, Colombia; L. de Geofroy. Back dull dark brown, irregularly streaked with ochraceous and buffy; wings and two middle tail-feathers fuscous, margined with ochraceous and reddish cinnamon; rest of tail brownish black, the outer pair of feathers margined externally with buffy white; bend of wing dark pinkish vinaceous; occiput, cervix and upper tail-coverts pinkish vinaceous, much streaked, and overlaid with brownish; fore part of crown, horns, lores, cheeks and jugulum black, more or less obscured by paler tips to the feathers; forehead, superciliary stripe, auricular region and throat pale primrose yellow; breast heavily shaded and streaked with dusky; sides dull cinnamonous, streaked with dark brown; rest of lower surface white.

Adult female in breeding plumage.—No. 147326, U.S.N.M.: Bogota, Colombia.—Upper surface sepia, streaked with buffy and ochraceous, the nape buffy, streaked with dark brown, the shorter upper tail-coverts reddish cinnamon; wings and middle tail feathers fuscous, margined with buffy and reddish cinnamon; rest of tail brownish black, the exterior pair of feathers margined externally with buffy white; bend of wing rufous; sides of head mixed brownish, yellowish, and buffy; forehead, superciliary stripe and throat pale yellow; jugulum dull black; breast buffy, streaked with brown; sides of body brownish gray, streaked with dark brown; rest of under parts white.

This race is similar to *chrysolæma*, but considerably smaller and more conspicuously streaked below; the cervix and bend of wing less pinkish. From *oaxacæ* it may be distinguished by its much darker, less rufescent colors above, heavier streaking below, as well as by somewhat smaller size.

Although not recognized by Dr. Dwight, this form of *Otocoris* is quite distinct. Notwithstanding that its range is a rather restricted one, and that it has no relative geographically nearer than Oaxaca, the differences between it and the other races are such as to make a trinomial best expressive of its relationship.

The only specimens that have been seen are from the vicinity of Bogota, Colombia.

OTOCORIS ALPESTRIS CHRYSOLÆMA (Wagler).

Alauda chrysolæma WAGLER, Isis, 1831, p. 530.

Otocoris alpestris chrysolæma STEINER, Proc. U. S. Nat. Mus., V, 1882, p. 34.

Alauda minor GIRAUD, Sixteen Species North Amer. Birds, 1841, p. 33 (not of Gmelin).

Otocorys alpestris chrysolæma HENSHAW, Auk, I, July, 1884, p. 260.

Otocoris alpestris chrysolæma DWIGHT, Auk, VII, April, 1890, p. 149 (part).—RIDGWAY, Man. N. Am. Birds, 2d. ed., 1896, p. 349 (part).

Chars. subsp.—Resembling *Otocoris a. peregrina*, but larger; lighter above, with the nape more pinkish.

Measurements (15 males).—Wing, 98.5–106.5 (average, 102.9) mm.; tail, 64–71.5 (average, 68.8) mm.; exposed culmen, 10–12 (average, 10.9) mm.; tarsus, 20–23.5 (average, 21.4) mm.; middle toe, 10.5–12 (average, 11.2) mm.

Type locality.—"Mexico:" probably the valley of Mexico or vicinity.

Geographical distribution.—Mexico, from Puebla and central Vera Cruz to Zacatecas and eastern Jalisco. Nearly or quite resident.

Description.—*Adult male in breeding plumage.*—No. 71212, U.S.N.M.; Valley of Mexico, Mexico. Back, wings and middle tail-feathers fuscous, edged with buffy and cinnamon; remainder of tail brownish black, the outer pair of feathers margined with white; occiput, cervix, bend of wing and upper tail-coverts deep pinkish vinaceous with a cinnamon tinge; crown, horns, lores, cheeks and jugulum black; forehead, superciliary stripe, auriculars, chin and throat pale yellow, deepest on the two last; rest of lower parts white, the sides streaked with pinkish cinnamon.

Adult female in breeding plumage.—No. 145013, U.S.N.M., Biological Survey Collection; Atlixco, Puebla, July 26, 1893; E. W. Nelson. Resembling the adult male in summer dress, but black of crown and sides of head replaced by mixed brown and blackish; occiput and cervix pale cinnamon buff streaked with fuscous; bend of wing less extensively pinkish vinaceous; yellow of head and throat somewhat paler; black area of jugulum smaller.

Adult male in winter plumage.—No. 145015, U.S.N.M., Biological Survey Collection; Salazar, Mexico, Mexico, October 23, 1892; E. W. Nelson. Similar to the summer plumage, but upper surface quite uniform, the black of crown and the vinaceous of cervix almost entirely obscured by brownish tips to the feathers; yellow of head and throat deeper; black jugular crescent obscured by pale yellow and buffy; breast heavily streaked with dusky.

Adult female in winter plumage.—No. 144970, U.S.N.M., Biological Survey Collection; Salazar, Mexico, Mexico, October 24, 1892; E. W. Nelson. Like the summer garb, but darker and more uniform above; yellow of throat and head deeper; black jugular crescent obscured by paler; breast heavily streaked with dusky.

Otocoris a. chrysolæma resembles *strigata*, but is of larger size and more grayish color above, the nape more pinkish, the yellow of throat rarely showing below the back pectoral area, and in winter the streaks on breast more conspicuous. The present race is even more nearly like *insularis*, from which it differs chiefly in larger size and rather more brownish coloration. From *merrilli* it is distinguished by much more brownish color above and deeper yellow of throat and eyebrow.

The earliest name for any of the Mexican horned larks is *Alanda chrysolæma*,¹ and although the locality given is simply "Mexico," the

¹ Wagler, Isis, 1831, p. 530.

specimens on which it was based came probably from the vicinity of the Valley of Mexico, and to the race from this region Mr. Nelson has lately restricted this name.¹ The type of *Alauda minor* Giraud² is in the U. S. National Museum, and has been carefully examined and compared. That it does not belong to the race *giraudi* is absolutely certain, notwithstanding Mr. Henshaw's statement to the contrary³. It agrees with Giraud's original description, but is altogether too dark as well as too rufescent for the Texas form, and seems to be the same as birds from Puebla and Vera Cruz. The name, however, is unavailable in any case, being preoccupied by *Alauda minor* Gmelin (= *Anthus trivialis*).⁴ The discovery that at least one of Giraud's famous "sixteen species of Texas birds" surely did not come from that State is exceedingly interesting and suggestive. This race has no other synonyms, since *Alauda glacialis* of Lichtenstein⁵ is a *nomen nudum*.

A number of males from Salazar and the valley of Toluca, both in the State of Mexico, have the cervix somewhat more pinkish than obtains in most of the specimens of a large series from Ajusco, in the same State; the females also, from the first-mentioned localities, appear to be duller or less conspicuously ochraceous, although this may be largely seasonal. The birds from Tlaxcala, Puebla, and central Vera Cruz differ somewhat from those of the State of Mexico in being rather smaller, paler and more rufescent on the upper parts. They are thus to some extent intermediate between *chrysolæma* and *oaxaca*, though very much nearer the former. If comparison be instituted between these specimens and typical *actia* from California, however, it will be at once seen that they are exceedingly similar and, to say the least, difficult to distinguish, forming another of those perplexing cases of forms reduplicated by apparent intergradation of two or more others. To call these *actia*, or to call them typical *chrysolæma* together with all the California birds and rename the race from the State of Mexico, or to give them a separate designation, would serve simply to increase the difficulty, so the only logical course is to consider them aberrant examples of *chrysolæma*.

While referring to this race a breeding specimen from Silao, Guanajuato, it should be stated that in color and size it almost exactly matches examples from Tlaxcala, differing thus from birds of the valley of Mexico, which occupy an intervening area, and was probably produced by the intergradation of true *chrysolæma* with *aphrasta*, plus possibly some infusion of *diaphora*. Two August specimens in fresh plumage, one from Mesquitic, Jalisco, the other from Plateado, Zacatecas,

¹ Auk, XIV, Jan. 1897, p. 55.

² Sixteen Species North Amer. Birds, 1841, p. 33.

³ Auk, I, July, 1884, p. 260.

⁴ Syst. Nat., I, 1788, p. 793.

⁵ Preis-Verz. Mex. Vög., 1830, p. 2, No. 59.

apparently also belong here, being much darker than either *aphrasta* or *diaphora*.

This is one of the dark races, particularly in winter. In the deep yellow color of the throat and eyebrow *chrysolæma* is very uniform; in winter plumage the breast just below the black jugular crescent is frequently tinged, though never extensively, with the same. The feathers of the tibia, particularly those of the lower portion, are also often conspicuously yellow. The upper surface varies much in color, in some specimens being very dark, with back and cervix strongly contrasted; in others much lighter, the cervix more pinkish in shade, the back only inconspicuously streaked and showing a tendency toward complete obliteration of the line of demarcation between it and the cervix.

Fifty-seven specimens examined, from the localities given below, those marked by an asterisk indicating records of breeding:

Guanajuato.—Silao.*

Jalisco.—Mesquitic.

Mexico.—Valley of Mexico;* Ajusco; Salazar; Valley of Toluca; Amecameca.

Puebla.—Puebla; Atlixco;* San Martin;* Chalchicomula.*

Tlaxcala.—Apexoco;* Huamantla.*

Vera Cruz.—Perote;* Mirador [40 miles west].*

Zacatecas.—Plateado.

OTOCORIS ALPESTRIS ACTIA, new subspecies.

Alauda rufa AUDUBON, Birds Amer., VII, 1844, p. 353, pl. cccxcvii (not of Gmelin).

Otocorys alpestris rubeus HENSHAW, Auk, I, July, 1884, p. 260 (part).

Otocorys alpestris chrysolæma DWIGHT, Auk, VII, April, 1890, p. 149 (part).—RIDGWAY, Man. N. Am. Birds, 2d ed., 1896, p. 349 (part).

Otocorys alpestris pallida DWIGHT, Auk, VII, April, 1890, p. 154 (part).

Chars. subsp.—Similar to *Otocorys a. chrysolæma*, but upper surface paler, more rufescent; yellow of throat and head of not so deep a shade.

Measurements (15 males).—Wing, 94–102.5 (average, 99.1) mm.; tail, 62–70 (average, 65.9) mm.; exposed culmen, 10–12.5 (average, 11) mm.; tarsus, 20–21.5 (average, 20.8) mm.; middle toe, 10.5–12 (average, 11.5) mm.

Type locality.—Jacumba, San Diego County, California.

Geographical distribution.—Coast region of northern Lower California and of southern California north to San Francisco Bay, including the San Joaquin Valley.

Description.—*Adult male in breeding plumage*.—Type, No. 133678, U.S.N.M.; Jacumba, San Diego County, California, May 23, 1894; Edgar A. Mearns. Back sepia, with a rufous wash, and streaked with ochraceous; occiput, cervix, bend of wing and upper tail-coverts

pinkish cinnamon rufous; wings and two middle tail-feathers fuscous, margined with buff, cinnamon and ochraceous; forepart of crown, horns, lores, cheeks and jugulum black; forehead, superciliary stripe, auriculars, chin and throat pale yellow; sides of body pale cinnamon brownish, streaked with dark brown; rest of under parts white.

Adult female in breeding plumage.—No. 163477, U.S.N.M.; Santa Cruz, California, March 26, 1898; R. C. McGregor. Back and head sepia, streaked with buffy and ochraceous; nape cinnamon, streaked with dark brown; bend of wing and upper tail-coverts cinnamon rufous; wings and two middle tail-feathers fuscous, edged with buff and ochraceous; rest of tail brownish black, the outer pair of feathers margined with dull white; forehead, superciliary stripe, infra-auricular region, chin and throat pale yellow; sides of head mixed brownish, grayish and buffy; jugulum black; breast washed with cinnamon; sides shaded with the same color, and streaked with dark brown; remainder of lower surface white.

Adult male in winter plumage.—No. 134321, U.S.N.M.; San Diego, California, September 1, 1894; Dr. Edgar A. Mearns. Similar to the summer male, but duller and less reddish above, the colors more blended; nape, occiput, bend of wing and upper tail-coverts more pinkish; black areas obscured by grayish or brownish tips; breast spotted with dusky.

Adult female in winter plumage.—No. 134322, U.S.N.M.; San Diego, California, September 1, 1894; Dr. Edgar A. Mearns. Resembles the summer female, but is darker, duller and more uniform above—all the decided markings toned down; breast heavily washed with buffy and conspicuously streaked with dusky.

Young in first plumage.—No. 133966, U.S.N.M.; last monument on Mexican and United States boundary line, at Pacific Ocean, in San Diego County, California, July 14, 1894; Frank X. Holzner.—Back and head sepia, streaked and spotted with buffy and ochraceous; cervix ochraceous, barred with dull rufescent brown; wings and two middle tail-feathers fuscous, margined with buffy and ochraceous; rest of tail brownish black, the outer pair of feathers edged with white; sides of head mixed brownish and buffy; throat yellowish white, with few spots of dusky; breast deep buff, heavily spotted with dusky; sides of body shaded with cinnamon buff; rest of under surface dull white.

This California subspecies may be most readily distinguished from true *chrysolaema* of the Valley of Mexico by the much paler yellow of the head and throat, in addition to the lighter, more rufescent color of the upper surface. It averages smaller, and the cinnamonaceous portions of the plumage have usually less pinkish tinge. The differential color characters are, as is quite often the case among the races of *Otocoris alpestris*, much more strongly marked in autumn and winter than in summer specimens. In this case it is due in a measure to the fact that

winter examples of *actia* are not so very different from spring birds, while those of *chrysolæma* are much darker and more richly colored. In size, however, there seems to be quite a substantial difference, as may be seen by the accompanying measurements. The deeper yellow of the throat and head of *chrysolæma*, while not in spring and summer a perfectly constant character, though, however, an excellent average one, is very pronounced during the remainder of the year. The difference in the pinkish tinge of the two races is perhaps most evident on the lesser and median wing-coverts and on the sides of the neck and breast. The foregoing remarks are based entirely on the males. Autumnal females of *actia* are decidedly paler and more rufescent on the upper surface than corresponding examples of *chrysolæma*, and the yellow of the throat and head is not so deep. From *rubea*, with which it intergrades in central California, *actia* differs in the much more pinkish tint of cervix, rump and bend of wing, as well as in its more grayish back which is usually in more or less abrupt contrast to the color of the nape. Some specimens, particularly fall and winter females, are difficult to separate from *strigata*, but in such doubtful cases the less extent and less intensity of the yellow on head and under parts, the paler, more buffy tinge above, together with the much less blackish back, will generally suffice for identification. From *merrilli* any questionable birds may be distinguished by the more rufescent or brownish coloration, combined with smaller size. Compared with Mr. Nelson's *oaxacæ* it has usually paler yellow on the head and throat, and is much less reddish on the back and cervix. It holds thus in color an intermediate position between *chrysolæma* and *oaxacæ*, although the former occupies the intermediate geographic area.

As in the other forms, the young of *actia* show much variation, both in depth of color and in the amount of ochraceous suffusion. They differ from the young of *merrilli* in paler general coloration, in the browner, less blackish shade of the dark areas, and in the much more ochraceous tint of all the lighter portions of the upper parts.

Dr. Dwight, in his review of the North American horned larks, considered that the birds breeding in the southwestern coast region of California, although occupying a disconnected area, were directly referable to the Mexican form, *Otocoris a. chrysolæma*.¹ Such a condition, moreover, would not be at all surprising, for similar instances are not by any means rare in this genus. Dr. Dwight had only a few Mexican specimens, and these seemed to indicate the correctness of his conclusion; but since then there has been accumulated a large series in the collection of the United States Biological Survey, chiefly through the efforts of Mr. E. W. Nelson, which series at last renders it possible to separate the California bird, partly on differences mentioned by Dr. Dwight but not by him considered diagnostic.

¹Auk, VII, 1890, p. 150.

The supposed type of Audubon's *Alauda rufa*,¹ with which his plate and description agree, has been examined, and belongs evidently to the Californian race, rather than to *chrysolaema* proper. This name, however, is not available for the form in question, being preoccupied by *Alauda rufa* Gmelin² (= *Anthus rufus*).

A considerable series of breeding horned larks from the vicinity of Milton, California—which it will be noticed is only about 20 miles east of Stockton, the reputed type locality of *rubea*—and several winter specimens from Valley Springs, Calaveras County, California, are variously and quite perplexingly intermediate between *actia* and *rubea*. Some of the specimens from Milton, if examined alone, are apparently nearer *rubea*; others from the same place are undoubtedly closer to *actia*; while still others are intermediate between these two extremes—and all breeding in one locality. Taken as a whole, together with those from Valley Springs above mentioned, they seem to average rather nearer *actia*. Breeding birds from elsewhere in Calaveras County are also to be referred to *actia*, as apparently must also be a June female from Stockton. A single male from Chinese Camp, California, though to some extent resembling *rubea* in the ruddiness of the upper parts, seems to be nearer the present race; while an example from Fresno, California, is quite typical. Thus it appears that the horned lark of the San Joaquin Valley is *actia*—not *rubea*, as Dr. Dwight surmised would prove to be the case.³

A July specimen from Kernville, California, shows only a slight approach to *ammophila*; but a breeding male from Tehachapi, California, is decidedly intermediate, though nearer *actia*, being moreover curiously similar to *adusta*. The birds from the western part of the Mexican border of California are identical with those of the coast region north toward San Francisco; but some specimens from San Fernando, Lower California, are slightly paler, yet referable clearly to *actia*; and birds from the vicinity of San Francisco Bay average larger and darker, more reddish above. A pair of adult breeding *Otocoris* from Santa Rosalia Bay, Lower California, are considerably paler and smaller than typical *actia*, being, in fact, exceedingly similar to some specimens of *ammophila*, from the range of which form their locality is isolated by the interposition of the area inhabited by *actia*. These two specimens were called *pallida* by Dr. Dwight,⁴ but they differ from that race in their much smaller size; darker, less uniform color above; more pinkish nape; more brownish back; and more blackish rump. So far as the material at hand indicates, *actia* is almost entirely resident, for there are no specimens which can be positively stated to be out of its breeding range.

Possibly in none of the horned larks is purely individual variation

¹Birds America, VII, 1843, p. 353, pl. cccxcvii.

³Auk, VII, 1890, p. 151.

²Syst. Nat., I, 1788, p. 792.

⁴Idem, p. 155.

more marked than in the present form. Particularly is this noticeable in the color of the upper surface; for from the gray and pink tints of some specimens to the reddish and cinnamon shades of others, from the pallid appearance of some to the deep colors of others, there seems to be almost more latitude than can possibly be reconciled to the idea of subspecific identity; yet such is undoubtedly the fact, as breeding specimens from identical localities attest. Some incidental mention of these variations has been made in the comparisons of *actia* with other forms. The yellow of the head and throat is rarely of a deep shade, though this color is seldom entirely absent from the latter; but the eyebrow is frequently white. The thighs are sometimes tinged with yellow.

In all, 238 specimens of this form have been available, geographically distributed as follows, the breeding records shown by an asterisk:

California.—Jacumba (United States and Mexican boundary line);* Pacific Ocean at the United States and Mexican boundary line;* Santa Barbara;* Calaveras County;* Tehachapi;* Stockton;* Milton;* San Diego;* Chinese Camp;* Valley Springs, Calaveras County;* Fresno;* Santa Cruz;* Laguna, San Diego County (United States and Mexican boundary line);* Haywards;* Poway; San Simeon; San Francisco; Riverside; Elmira;* Fort Tejon; Nicasio;* Kernville;* Berryessa;* Milpitas;* Monterey County;* Cameron Ranch, San Diego County;* Los Angeles;* Los Gatos;* Ballena;* Beaumont;* San Jacinto Mountains;* San Jacinto Valley;* Pacific Beach;* Santa Ysabel, San Diego County; Dalzura;* Banning;* Twin Oaks;* Port Ballona;* Alhambra;* San Bernardino Valley; Pasadena;* Campbell's Ranch, Laguna Mountains, San Diego County.

Lower California.—San Fernando;* Nashoguerro Valley (United States and Mexican boundary line);* San Ysidro Ranch (United States and Mexican boundary line);* Santa Rosalia Bay.*

OTOCORIS ALPESTRIS AMMOPHILA, new subspecies.

Otocoris alpestris arenicola FISHER, North Am. Fauna, No. 7, 1893, p. 66 (part).

Otocoris alpestris chrysolæma FISHER, North Am. Fauna, No. 7, 1893, p. 67 (part).

Chars. subsp.—Like *Otocoris a. actia*, but very much paler above.

Measurements (15 males).—Wing, 96–103.5 (average, 100.2) mm.; tail, 65–72 (average, 67.7) mm.; exposed culmen, 10–12.5 (average, 11.4) mm.; tarsus, 19–22.5 (average, 21.1) mm.; middle toe, 10–12.5 (average, 11.4) mm.

Type locality.—Coso Valley, southeastern California.

Geographical distribution.—In summer, the Mohave Desert, north to Owens Valley, California; in winter, south to the Mexican boundary line.

Description.—*Adult male in breeding plumage*.—Type, No. 139892, U.S.N.M., Biological Survey Collection; Coso Valley, California, May

11, 1891; T. S. Palmer. Back and scapulars sepia, rather darker posteriorly, streaked with buffy; wings and middle tail-feathers fuscous, margined with buffy and cinnamon; rest of tail brownish black, edged exteriorly with white; occiput, cervix, bend of wing and upper tail-coverts pinkish cinnamon rufous; horns, crown, lores, cheeks and jugular crescent black; forehead, superciliary stripe, auriculars, chin and throat pale yellow; sides and flanks tinged with cinnamon and obsoletely streaked with dusky; rest of lower surface white.

Adult female in breeding plumage.—No. 139875, U.S.N.M., Biological Survey Collection; Coso Valley, California, May 11, 1891; A. K. Fisher. Similar to the adult male, but cervix pale cinnamon, streaked with brownish; crown and occiput fuscous, streaked with pale cinnamon; bend of wing and upper tail-coverts much paler and less pinkish; black of head replaced by brownish; auriculars brownish gray; yellow of head and throat rather paler; black jugular crescent smaller.

Adult male in winter plumage.—No. 139871, U.S.N.M., Biological Survey Collection; Granite Springs, California, January 13, 1891; A. K. Fisher. Very similar to the summer dress, but upper parts duller and more uniform; the cervix, bend of wing, sides of neck and breast, and upper tail-coverts much more pinkish, the black areas tipped with grayish.

Adult female in winter plumage.—No. 139888, U.S.N.M., Biological Survey Collection; Keeler, California, December 28, 1890; E. W. Nelson. Exceedingly similar to the summer female, but rather paler and more ochraceous above, the bend of wing and upper tail-coverts darker and more vinaceous, the yellow of throat and head rather deeper, the breast sparingly streaked with dusky.

Young in first plumage.—No. 139881, U.S.N.M., Biological Survey Collection; Owens Valley, California, July 20, 1891; F. Stephens. Above sepia, mixed with buffy ochraceous, spotted with pale buffy and white; wings and tail sepia, edged with buffy and ochraceous buff, the middle tail-feathers paler than the others; sides of head and neck mixed grayish, brownish and buffy; throat white, washed with sulphur yellow; jugulum and upper breast pale buff, spotted with dusky; remainder of lower surface white, the sides faintly tinged with dull buff.

From *actia* the present subspecies may be easily distinguished by its very much paler color above, while its decidedly smaller size, conspicuously more cinnamonaceous shade of nape, upper tail-coverts and bend of wing render it readily separable from *leucolæma*. Compared with *occidentalis* it is paler, of smaller size, with the cervix, upper tail-coverts, and bend of wing more cinnamonaceous, the upper surface less uniform. It is somewhat smaller than *adusta* and paler, particularly in winter, with the back scarcely or not at all reddish, the demarcation line between cervix and back usually well marked. From *oaxacae* it differs in larger size, much paler colors, and less reddish back.

The young of *ammophila* differ markedly from the young of *actia* in their paler, much more grayish upper parts; being practically indistinguishable from *leucolæma* of the same age.

This desert race seems to be most typical in the region immediately southwest of Death Valley, California, whence a good series of specimens was brought back by the Death Valley expedition of 1891. The breeding birds in this series were identified as *arenicola* [= *leucolæma*], the winter specimens as *chrysolaema* [= *actia*].¹ No material indicates whether or not it inhabits Death Valley, but it apparently comes no farther east in the breeding season. Its northern limit is Owens Valley, California, but the southern extent of its range can not now be definitely determined. Birds from the Mojave Desert differ little, if any, from typical specimens, but the range of *ammophila* is circumscribed on the west by the mountains defining the valley of the San Joaquin River, as is shown by the horned larks from Tehachapi and Kernville, which are referable to *actia*. Examples from Owens Valley (Keeler, etc.) seem to verge somewhat toward *leucolæma*.

The eyebrow is usually, the throat nearly always distinctly yellow, though both are sometimes, particularly in females and summer birds, almost without trace of this color. The shade of the nape is quite variable, being occasionally decidedly pinkish, and its trenchant definition from the dorsal area is frequently obliterated by the backward extension of the cinnamon tinge of the nape.

Forty-two specimens have been examined, from the subjoined localities:

California.—Argus Mountains; * Granite Springs; Coso Valley; * Keeler; * North base of Granite Mountains, Mohave Desert; * Mohave; Daggett; 25 miles southwest of Mohave; * Borax Flat; * Olanche; * Perognathus Flat, Panamint Mountains; * Ash Creek, Owens Lake; * Bongo Spring, San-Diego County; Santa Ysabel, San Diego County; Calico; Darwin.*

OTOCORIS ALPESTRIS RUBEA Henshaw.

Otocorys alpestris rubeus HENSHAW, Auk, I, July, 1884, p. 267.

Otocoris alpestris rubea DWIGHT, Auk, VII, April, 1890, p. 150.—RIDGWAY, Man. N. Am. Birds, 2d ed., 1896, p. 349.

Chars. subsp.—Similar to *Otocoris a. ammophila*, but darker, the cervix and back much more distinctly reddish.

Measurements (15 males).—Wing, 94.5–105 (average, 99.6) mm.; tail, 64.5–71 (average, 67.2) mm.; exposed culmen, 10–12 (average, 11) mm.; tarsus, 20–23.5 (average, 21.7) mm.; middle toe, 10.5–13 (average, 11.8) mm.

Type locality.—Stockton, California.

Geographical distribution.—The Sacramento Valley, California.

¹See Fisher, North American Fauna, No. 7, 1893, pp. 66–67.

Description.—*Adult male in breeding plumage.*—No. 98402, U.S.N.M.; Red Bluff, California, April 12, 1884; Charles H. Townsend.—Back fuscous, much suffused and mixed with dull reddish cinnamon, producing a rather uniform effect; occiput, nape, bend of wing and superior tail-coverts brick red; wings fuscous, margined with reddish cinnamon and buffy; two middle tail-feathers similar to the back; rest of tail brownish black, the outer pair of feathers margined externally with buffy white; fore part of crown, horns, lores, cheeks and jugulum black; forehead, superciliary stripe, auriculars, chin and throat pale primrose yellow; remainder of lower surface white, the sides tinged with reddish cinnamon and somewhat streaked with dusky.

Adult female in breeding plumage.—No. 98413, U.S.N.M.; Red Bluff, California, April 12, 1884; Charles H. Townsend.—Similar to the adult male at the same season, but back rather less uniform; occiput dull brownish, streaked with darker; nape dull pinkish cinnamon, broadly streaked with brown; black of crown replaced by dark brownish; black of cheeks and lores much mixed with brown.

Adult male in winter plumage.—No. 124407, U.S.N.M.; Gridley, California, January 25, 1891; L. Belding.—Similar to the summer male, but darker, duller and more uniform above; the yellow of throat and head deeper; breast tinged with yellow of throat; sides of body darker.

Adult female in winter plumage.—No. 139862, U.S.N.M., Biological Survey collection; Willows, California, January 4, 1894; C. P. Streater.—Like the female in summer, but everywhere darker, the breast shaded with brownish and somewhat streaked with dusky.

This form is easily distinguishable from all the other horned larks by the peculiar color of the occiput and cervix, which is a bright brick red with very little tinge of pinkish, particularly in summer; the remainder of the upper surface is much suffused with the same shade, further differentiating *rubea* from both *insularis* and *strigata*, which races in other respects it closely resembles.

The type of *rubea* is an adult male, evidently in breeding plumage, collected by Mr. Belding, supposedly at Stockton, California. This locality, however, is queried on the label, and there seems now much reason to believe that this specimen did not come from Stockton at all, for the horned larks breeding there, though not typical *actia*, are nearer that form than to *rubea*; yet heretofore they have been referred to *rubea*, probably on the strength of the type. This bird in all probability came from some locality in the Sacramento Valley north of Stockton, as it is a specimen very typical of the race inhabiting the region about Red Bluff and Mount Lassen, California, and which passes current under the proper name of *rubea*. Mr. Henshaw in his original description included both *rubea* and *actia* of the present review.¹

¹Auk, I, July, 1884, p. 260.

The present race appears to be strictly resident, occupying a comparatively circumscribed area in the region drained by the Sacramento River, passing south into *actia* at about the latitude of San Francisco, and northeastward into *merrilli*. Comparatively few of the specimens here referred to *rubea* show indication of intergradation with any of the other forms, but a number of intermediates that more closely approach *merrilli* and *actia*, respectively, are discussed under those races. Several spring birds from Gridley appear to incline somewhat in the direction of *actia*, this being especially the case with the females, all of which were determined by Dr. Dwight to be *strigata*; but the general cast of the plumage, particularly on the nape, bend of wing and upper tail-coverts, seems to indicate by lack of sufficient brownish tinge that these examples are correctly identified as *rubea*.

An adult male horned lark purporting to have been collected by Xantus at Tonila, Jalisco, Mexico, appears to be absolutely indistinguishable from specimens of *rubea* taken in the Sacramento Valley, and not like either *chrysolæma* from the Valley of Mexico or *oaxacæ* from the State of Oaxaca. The ostensible locality is possibly erroneous, this suspicion being strengthened by the fact that the specimen is labeled "Oct.," though it is evidently in breeding plumage. On the other hand, the fact that the breeding horned lark of the city of Durango, Durango, Mexico, shows a decided approach to this ruddiness of plumage renders possible and really almost probable that the *Otocoris* from still farther south is fully as reddish as *rubea*. Should future investigation prove this to be the case, it will add another to the already considerable list of instances of reduplication of forms in this genus.

The throat in *rubea* is usually pale, scarcely ever very deep yellow, sometimes almost white; the eyebrow, particularly in summer females, is not infrequently without a trace of yellow. The breast for a short distance below the black is occasionally, especially in winter, tinged with yellow; the thighs also, though rarely, show some of this color. One newly molted example, from Bald Mountain, Shasta County, California, has the entire under surface strongly suffused with yellow. In some specimens the reddish color of the nape is much spread over the back, in others it is posteriorly confined to the nape, with a well-defined line of demarcation between it and the color of the back; occasionally, and this particularly in worn summer birds, the occiput and nape have a distinct pinkish tinge.

Thirty-nine specimens of this race have been examined, representing the following localities:

California.—Red Bluff;* Mount Lassen;* Placer County;* Yuba County; Gridley;* Marysville; Bald Mountain, Shasta County; Stockton; Willows; Santa Cruz; Battle Creek.

OTOCORIS ALPESTRIS OAXACÆ Nelson.

Otocoris alpestris pallida DWIGHT, Auk, VII, April, 1890, p. 154-155 (part).

Otocoris alpestris oaxacæ NELSON, Auk, XIV, Jan., 1897, p. 54.

Chars. subsp..—Similar to *Otocoris a. rubea*, but rather smaller, the nape and bend of wing somewhat pinkish, the back less reddish.

Measurements (10 males).—Wing, 94.5-99 (average, 96.8) mm.; tail, 58-66 (average, 61.3) mm.; exposed culmen, 11-12 (average, 11.5) mm.; tarsus, 21-23.5 (average, 21.9) mm.; middle toe, 10.5-13 (average, 11.9) mm.

Type locality.—San Mateo del Mar, Oaxaca, Mexico.

Geographical distribution.—Southern Oaxaca, Mexico. Resident.

Description.—*Adult male in breeding plumage*.—Type, No. 145003, U.S.N.M., Biological Survey collection; San Mateo del Mar, Oaxaca, Mexico, May 15, 1895; E. W. Nelson and E. A. Goldman. Back dull rufous brown, streaked with darker; occiput, cervix, bend of wing and upper tail-coverts deep cinnamon rufous, with a decided pinkish tinge, this color gradually merging with the brown of the back, leaving no line of demarcation; wings and two middle tail-feathers fuscous, margined with buffy and cinnamon; rest of tail brownish black, the two outer feathers edged with buffy; forepart of crown, horns, lores, cheeks and jugulum black; forehead, superciliary stripe, auricular region, chin and throat yellow, brightest on the last mentioned; sides of body pinkish cinnamon; rest of under surface dull white.

Adult female in breeding plumage.—No. 145001, U.S.N.M., Biological Survey collection; San Mateo del Mar, Oaxaca, Mexico, May 14, 1895; E. W. Nelson and E. A. Goldman. Similar to the male, but differs in the less rufescent, less uniform back; in lack of black on crown, this being replaced by deep ochraceous streaked with blackish; in having the occiput and nape buffy ochraceous, streaked with dark brown, the bend of the wing less extensively cinnamon rufous, and the black of the sides of head replaced by buffy and brownish.

Young in first plumage.—No. 145004, U.S.N.M., Biological Survey collection; San Mateo del Mar, Oaxaca, Mexico, May 16, 1895; E. W. Nelson and E. A. Goldman. Above deep cinnamon, each feather with a subterminal spot of sepia and a terminal one of buffy or ochraceous, these markings small on the head, but large on the lower back, where the terminal buffy ones become broad edgings; tail much as in the adult; wings fuscous, edged with buff, cinnamon and ochraceous; sides of head mixed buffy and brownish; breast and sides buffy, finely spotted with dusky; remainder of lower surface dull buffy white.

In the color of the upper parts this form is much like *rubea*, but the cervix, upper tail-coverts and bend of wing are darker and more pinkish, the back less rufescent; the measurements indicate a smaller

bird. From *chrysolæma* it differs in conspicuously more rufescent, more uniform colors above, and in smaller size.

The young of *oaxacæ* resemble those of *actia*, but are everywhere, even on the under surface, more strongly tinged with ochraceous; the crown seems to be less blackish.

It is certainly strange that there should be any notable local variation in the horned larks from a locality close to the city of Oaxaca, whence come specimens apparently inseparable from *Otocoris alpestris oaxacæ*, a locality, moreover, which lies practically between the city of Oaxaca and San Mateo, the type locality of *oaxacæ*; yet the differences exhibited by the horned larks from Mitla, Oaxaca, are scarcely reconcilable with ordinary range of individual variation, neither can they be considered as the result of abrasion during the breeding season. The series from this place was taken in June, only a few days later than the specimens from the city of Oaxaca, so that these birds are strictly comparable. The specimens from Mitla are, so far as color is concerned, not in any degree intermediate between the only two subspecies whose areas of distribution can by the slightest possibility be contiguous, being much paler than either *oaxacæ* or *chrysolæma*. They are much more rufescent above than the latter, and agree in size with the former. They are almost perfectly identical with the non-typical examples of *actia* from Santa Rosalia Bay, Lower California, which are in turn almost inseparable, though geographically isolated, from *ammophila*. In view of this condition of affairs it seems best to consider these Mitla specimens as belonging to *oaxacæ*, which form they more nearly approach than to *chrysolæma*. A female from the type locality of *oaxacæ*, worn and faded almost beyond recognition, is in the U. S. National Museum collection, and is probably the specimen which Dr. Dwight referred provisionally to *pallida*.¹

A series of eight males from the type locality exhibits no important individual variations, the chief differences observable being the somewhat more pinkish nape or less reddish back of some specimens. The eyebrow, even in females, appears never to lack a tinge of yellow, while the feathers of the tibia, at least in summer, show rarely any noticeable trace of this color.

Twenty-one specimens have been examined, from the localities which follow:

Oaxaca.—San Mateo del Mar;* Oaxaca;* Mitla.*

OTOCORIS ALPESTRIS OCCIDENTALIS (McCall).

Otocoris? occidentalis MCCALL, Proc. Acad. Nat. Sci. Phila., June, 1851, p. 218.

Otocoris alpestris occidentalis STONE, Proc. Acad. Nat. Sci. Phila., 1899, p. 21.

Eremophila alpestris b. *leucolæma* COUES, Birds Northwest, 1874, p. 38 (part).

Otocorys alpestris arenicola HENSHAW, Auk, I, July, 1884, p. 259 (part).

Otocoris alpestris adusta DWIGHT, Auk, VII, April, 1890, p. 148 (part).—RIDGWAY, Man. N. Am. Birds, 2 ed., 1896, p. 599 (part).

¹Auk, 1890, VII, p. 155.

Chars. subsp.—Resembling *Otocoris a. oaxacæ*, but larger and decidedly paler, less rufescent above.

Measurements (15 males).—Wing, 103.5–110.5 (average, 106.4) mm.; tail, 67–75 (average, 71.4) mm.; exposed culmen, 10–13 (average, 11.2) mm.; tarsus, 20–23 (average, 21.8) mm.; middle toe, 10.5–12.5 (average, 11.6) mm.

Type locality.—Santa Fe, New Mexico.

Geographical distribution.—In summer, central New Mexico, west to central Arizona; in winter, south to northern Sonora and Chihuahua, Mexico, and southeast to Texas.

Description.—*Adult male in breeding plumage.*—No. 68800, U.S.N.M.; Santa Fe, New Mexico, June 19, 1874; J. T. Rothrock. Occiput, cervix, bend of wing and upper tail-coverts deep vinaceous cinnamon; back fuscous, streaked with buffy and vinaceous, and anteriorly passing gradually into the color of the cervix; wings and two middle tail-feathers fuscous, margined with buffy and vinaceous; rest of tail brownish black, edged externally with whitish on two outer pairs of feathers; crown, horns, cheeks and jugulum black; forehead, superciliary stripe, auriculars, chin and throat pale yellow, remainder of lower surface dull white, the sides and flanks shaded with pinkish cinnamon.

Adult female in breeding plumage.—No. 68801, U.S.N.M.; Santa Fe, New Mexico, June 19, 1874; J. T. Rothrock. Head and back sepia, streaked with buff; cervix cinnamon with narrow streaks of sepia; otherwise similar to the summer male, excepting that the sides of body, bend of wing and upper tail-coverts are less vinaceous, the black of head is replaced by brownish, and the yellow is paler.

Adult male in winter plumage.—No. 127591 U.S.N.M.; Lochiel, Pima County, Arizona, November 25, 1892; Frank X. Holzner. Very similar to the summer male, but more uniform above, the colors paler and more blended, owing to the broad tips of the feathers; yellow of head and throat rather deeper; black areas more or less obscured by light tips; breast sparingly and obscurely spotted with dusky.

Adult female in winter plumage.—No. 151866, U.S.N.M.; Chihuahua, Chihuahua, November 7, 1888; M. Abbott Frazar. Very much like the breeding dress, but paler and more uniform above, the jugular crescent much obscured by grayish, the breast shaded with buff and obsoletely streaked with brownish.

Young in first plumage.—Type of species, No. 14883, Academy of Natural Sciences, Philadelphia; Santa Fe, New Mexico, July 1850; Col. Geo. A. McCall.¹

¹The type is so badly faded and otherwise so much damaged that the original description is here given instead of one taken directly from the specimen. Notwithstanding its condition, the type agrees well with a young bird from San Francisco Mountain, though somewhat darker above and with a longer bill.

Its length (when killed) was $7\frac{7}{10}$ inches; alar stretch, 11 inches; wing, from flexure, $3\frac{7}{10}$; above, light brown, each feather being dark dusky near the tip, the extreme tip white—giving the appearance of a mixture of light and dark brown, thickly speckled with white; in this respect resembling the young of the *Shore Lark*; the greater and lesser wing-coverts broadly edged with yellowish white, and tipped with pure white, forming two distinct bars, most apparent when the wing is extended; the second primary longest, the third shorter than the first, the outer vane of the latter white; remaining wing feathers edged with whitish, broadest on the tertials; tail of twelve feathers, even, the two middle ones light brown, edged with whitish, the remainder dark dusky, the two exterior ones being white on the outer vanes; all the under parts pale brownish white, most clear at the lower extreme; bill slender and slightly curved, of a horn color above, and lighter below; eyebrows, extending back of the eyes, whitish: irides dark hazel; legs and feet nearly black.¹

From *adusta*, to which it is most closely allied, *occidentalis* differs in its much larger size and decidedly less ruddy colors above, the nape being more pinkish, the back more dusky. It is distinguished from *oaxacæ* by much paler, less rufescent colors above, and by decidedly larger size; from both *actia* and *chrysolæma* by greater size, together with paler, more brownish coloration. Although of the same dimensions as *leucolæma*, this form may be separated by the darker, more cinnamomeous or rufescent shade of the entire upper surface, this in summer being particularly noticeable on the cervix; and these characters will serve to determine even doubtful specimens at all seasons.

Mr. Henshaw considered² the *Otocoris occidentalis* of McCall¹ to be indeterminable, but a careful comparison of the original description with a young horned lark seems to leave little or no doubt as to its identity. Dr. Dwight says nothing upon the subject, but evidently accepts Mr. Henshaw's conclusion.³ Since then, however, the type of *occidentalis* has come to light in the museum of the Academy of Natural Sciences, Philadelphia, and the question is thus definitely settled. The chief discrepancy emphasized by Mr. Henshaw was that McCall stated the whole of the under surface to be whitish, but this remark, as can clearly be seen with specimens of both young *occidentalis* and *alpestris* for comparison, was intended merely to suggest the general effect of the lower surface as contrasted with the strongly yellowish tinge of young *alpestris*.

The geographical variation exhibited by this race has hitherto been obscured, since Dr. Coues included *occidentalis* in his *leucolæma*; Mr. Henshaw referred it to *arenicola*, and Dr. Dwight to *adusta*; but the form is well worthy of recognition.

Some of the specimens from northern New Mexico, the vicinity from which came the type, incline towards *leucolæma*, but as a whole the birds from this region are much nearer what may abstractly be considered to represent typical *occidentalis*. Examples from Fort

¹Proc. Acad. Nat. Sci. Phila., June, 1851, p. 218.

²Auk, I, July, 1884, p. 259.

³Auk, VII, April, 1890, p. 146.

Verde, Arizona, are typical, that is, they represent the extreme differentiation of the race; and breeding birds from the Little Colorado River and San Francisco Mountain are to be referred here. These localities comprise all in Arizona from which breeding specimens have been seen, but the summer distribution of *occidentalis* may with reasonable safety be held to be the Territories of Arizona and New Mexico, excepting the southern and extreme western parts of the former, and the eastern and far southern portions of the latter. *O. a. leucolæma*, however, possibly encroaches on the northwestern corner of Arizona, but just how far the present material does not indicate.

In winter *occidentalis* occurs in Texas and also moves to the southward into the central portions of northern Mexico, as far as the city of Chihuahua, being found there in company with *aphrasta*, *adusta*, and *leucolæma*. The large number of intermediates causes considerable trouble in the identification of winter horned larks from northern Mexico.

Sixty-five specimens have been examined, from the following localities:

Arizona.—Big Chino Valley, near La Ventana ranch, Pima County (United States and Mexican boundary line); Buenos Ayres, Pima County (United States and Mexican boundary line); San Pedro River; Willecox; San Francisco Mountain;* Lochiel, Pima County; Fort Verde;* Little Colorado River.*

New Mexico.—Albuquerque;* Fort Wingate;* Grafton; Zuni; Santa Fe;* Fort Bayard; Silver City.

Texas.—Marfa; El Paso; Laredo; Sierra Blanca; Comanche; Henrietta.

Chihuahua.—San Luis Spring, Animas Valley (United States and Mexican boundary line); Chihuahua; San Diego.

Sonora.—La Noria, Santa Cruz River (United States and Mexican boundary line).

OTOCORIS ALPESTRIS ADUSTA Dwight.

Otocoris alpestris adusta DWIGHT, Auk, VII, April, 1890, p. 148.—RIDGWAY, Man. N. Am. Birds, 2d ed., 1896, p. 599 (part).

Chars. subsp.—Similar to *Otocoris a. occidentalis*, but much smaller, the upper surface more reddish.

Measurements (15 males).—Wing, 97–105.5 (average, 102.4) mm.; tail, 65–73 (average, 68.8) mm.; exposed culmen, 10–12 (average, 10.8) mm.; tarsus, 20.5–22 (average, 21.2) mm.; middle toe, 10–12 (average, 11.3) mm.

Type locality.—Camp Huachuca, Arizona.

Geographical distribution.—In summer, the central part of extreme southern Arizona; in winter, northern Sonora and Chihuahua, Mexico.

Description.—Adult male in breeding plumage.—Type, No. 23575,

collection of William Brewster; Camp Huachuca, Arizona, February 21, 1887; J. C. Cahoon. Upper parts almost uniform vinaceous cinnamon, the occiput, nape, bend of wing and upper tail-coverts more pinkish; tail, excepting the two middle feathers, black, the exterior rectrices edged with white. Forehead, horns, nasal plumes, lores, suborbital region, anterior auriculars, and jugular crescent black; forehead, superciliary stripe and hinder part of auriculars maize yellow, palest on the last; throat Naples yellow; rest of lower surface white, but the flanks, sides of breast and body vinaceous cinnamon, more pinkish on the sides of breast.

Adult female in breeding plumage.—No. 23588, collection of William Brewster; Camp Huachuca, Arizona, March 2, 1887. Similar to the male, but pale cinnamon above, streaked with darker, duller brown, most heavily so on occiput and back; no black on head, this color replaced by dull brownish; superciliary stripe and auriculars creamy white, the latter somewhat mingled with brownish; throat paler yellow, jugular crescent restricted.

Adult male in winter plumage.—No. 127334, U.S.N.M.; Santa Cruz River, Sonora, Mexico, November 6, 1892; Frank X. Holzner. Very much like the breeding dress, but back not so reddish; upper parts more uniform; black areas somewhat obscured; breast slightly spotted with dusky.

Adult female in winter plumage.—No. 144984, U.S.N.M., Biological Survey collection; Chihuahua City, Chihuahua, November 2, 1893; E. A. Goldman. Similar to the summer female, but upper surface more uniform and more pinkish; yellow of throat and head deeper; black areas more obscured; breast tinged with buffy and spotted with dusky.

Young in first plumage.—No. 139902, U.S.N.M., Biological Survey collection; Fort Huachuca, Arizona, May 22, 1892; A. K. Fisher. Upper surface bright ochraceous, more brownish on head and back, mottled with sepia and spotted with buffy; superciliary stripe deep buff; sides of head ochraceous, mixed with brownish; throat pale buffy; jugulum buff, spotted with dusky; sides washed with buff; rest of lower parts creamy white.

Although resembling *oaxaca* in general appearance, *adusta* is much lighter above and more reddish on the back; the yellow of the throat is usually paler and the size greater. From *rubea* this race is distinguished by paler, more uniform upper parts, and more pinkish cervix; from *actia* by the conspicuously lighter and more uniform upper surface, the nape especially being very pale, and the back reddish instead of blackish.

The young of this race are apparently nearest like those of *oaxaca*, but are even more deeply ochraceous. Some specimens are, however, almost indistinguishable. From *actia* the young of *adusta* differ in

rather paler, decidedly more ochraceous coloration, particularly above, and in the less blackish crown.

This subspecies occupies, in the breeding season, a very restricted area, more restricted, in fact, than most of the other continental forms; and to this is due, of course, its comparative rarity. It is only in part intermediate between *occidentalis* and *aphrasta*, and is one of the best defined of the races of *alpestris*. Breeding birds from the type locality are remarkably uniform and represent the extreme of differentiation, while nearly all those from other places show more or less indication of intergradation with surrounding forms. Specimens from the Santa Rita Mountains, Arizona, are generally larger and paler, and seem thus to incline somewhat toward *leucansiptila*. A June female from Oracle, Arizona, appears to be quite typical, though a good series might show the breeding horned larks from this locality to be somewhat aberrant. A young bird from Oracle strengthens this supposition, although, as we have already intimated, no great amount of reliance can be placed upon the identification of a single young individual. In autumn and winter *adusta* wanders to the southward, as far, at least, as the city of Chihuahua, Mexico, but does not seem to range much to the east or west.

Considerable individual variation is evident, consisting chiefly in the more or less scorched appearance of the back. The throat varies from a deep primrose yellow to occasionally almost white. Females exhibit a similar difference, observable in the depth of the cinnamon suffusion pervading the entire upper surface; the back and head are sometimes almost uniform, while in many cases the former is quite dark owing to broad brown centers of the feathers, there being then a noticeable contrast between the head and back.

Thirty-seven specimens have been examined, these representing the localities given below:

Arizona.—Fort Huachuca;* San Pedro River (United States and Mexican boundary line); Santa Rita Mountains;* Oracle;* Greaterville.*

Chihuahua.—Chihuahua City.

Sonora.—Santa Cruz River (United States and Mexican boundary line).

OTOCORIS ALPESTRIS APHRASTA, new subspecies.

Chars. subsp..—Like *Otocoris alpestris adusta*, but back less reddish, cervix and bend of wing more pinkish.

Measurements (15 males).—Wing, 99–104.5 (average, 102) mm.; tail, 64–72 (average, 68.5) mm.; exposed culmen, 10.5–12 (average, 11.2) mm.; tarsus, 20.5–22.5 (average, 21.3) mm.; middle toe, 10–12 (average, 11.1) mm.

Type locality.—Casas Grandes, Chihuahua, Mexico.

Geographical distribution.—Extreme southeastern Arizona, the southwest corner of New Mexico, together with the Mexican States of Chihuahua, Coahuila and Durango. Nearly or quite resident.

Description.—*Adult male in breeding plumage.*—Type, No. 165133, U.S.N.M., Biological Survey collection; Casas Grandes, Chihuahua, Mexico, May 13, 1899; E. W. Nelson and E. A. Goldman. Back and rump brownish cinnamon, the feathers with darker centers; occiput, cervix, bend of wing and upper tail-coverts pinkish vinaceous, tinged with cinnamon; wings and middle pair of tail-feathers fuscous, edged with color of back; rest of tail brownish black, the outer pair of feathers margined with white; lores, cheeks, crown, horns and jugulum black; forehead, auriculars and superciliary stripe dull white washed with yellow; throat pale yellow; sides and flanks cinnamon; rest of lower surface white.

Adult female in breeding plumage.—No. 124524, U.S.N.M., San Diego, Chihuahua, Mexico, June 5, 1891. Upper surface sepia brown, streaked with buffy, this little evident on back; cervix, bend of wing and upper tail-coverts cinnamon, the first streaked with dusky; wings fuscous, edged with paler; tail, excepting the two middle feathers, blackish brown, the outermost feathers margined externally with white; sides of head brownish gray, mixed with dark brown on cheeks; forehead and superciliary stripe white; throat pale yellowish; narrow jugular crescent black; sides washed with cinnamon, and obscurely streaked with dusky; remainder of lower surface white.

Adult male in winter plumage.—No. 163964, U.S.N.M., Biological Survey collection; Parral, Chihuahua, September 12, 1898; E. W. Nelson and E. A. Goldman. Similar to the breeding male, but upper parts more pinkish and more grayish, the colors more blended; the whole head and throat suffused with yellow; the black areas obscured by paler tips; breast spotted with dusky.

Adult female in winter plumage.—No. 151860, U.S.N.M.; Chihuahua, Chihuahua, Mexico, October 19, 1888; M. Abbott Frazar. Similar to the summer dress of the same sex, but upper parts paler and more uniform, owing to the wide margins of all the feathers, which produce a blended effect; cheeks and auriculars darker brownish; breast tinged with buffy, and heavily, though obscurely, streaked with dusky.

Young in first plumage.—No. 124525, U.S.N.M., San Diego, Chihuahua, Mexico, June 5, 1891. Back brownish cinnamon, spotted with sepia and buffy; rump, head and cervix buffy ochraceous, marked with sepia and whitish; wings and two middle tail-feathers fuscous, edged with buffy and ochraceous; rest of tail dark brown, the outer webs margined with white; sides of head pale brownish gray, slightly mixed with dull brownish; jugulum tinged with buff, and sparingly spotted with bark brown; sides washed with buffy; remainder of lower surface white.

Typical specimens of this race differ from *adusta* in the much less reddish back, as well as noticeably more pinkish nape and bend of wing; from *leucansiptila*, besides much darker colors above, in more pinkish nape and more brownish back, these last two characters being those of most value in the determination of intermediates. Compared with *pallida*, *aphrasta* is much darker, particularly on the back and rump, with decidedly less cinnamomeous tinge, this most conspicuous on occiput, cervix and bend of wing. It may be distinguished from *ammophila* by the more pinkish cervix, upper tail-coverts and bend of wing, together with the more uniform upper surface, the back having usually less blackish; from *actia* and *chrysolema*, by much paler and more uniform upper surface. It is much larger and paler than *oaxacæ*; decidedly smaller, as well as somewhat less deeply colored, than *occidentalis*; much smaller, more uniform, and more reddish above than *leucolæma*.

The young of this race differ from those of *actia* in their much paler coloration, this being especially noticeable on the top and sides of the head, but these are by no means constant distinctions. From *ammophila* and *leucolæma* the difference, which consists of the decidedly deeper ochraceous on all the upper parts, is more marked. Compared with *oaxacæ* and *adusta* the young of *aphrasta* are paler and somewhat more grayish.

Breeding specimens from Willecox and Fort Bowie, Arizona, show an inclination toward *leucolæma* in the pallor of the occiput and nape, but undoubtedly should be called *aphrasta*. Sulphur Spring and Willow Spring, Arizona, are also here included in the range of the present race, though it should be stated that this rests upon the determination of birds in first plumage. Breeding examples from San Diego, Chihuahua, Mexico, seem to be essentially typical; as also a series from La Ventura, Coahuila, though the males of the latter have the throat and eyebrow more deeply yellow, and the back with more admixture of brown, producing a less uniform appearance. None of the available specimens of this subspecies can certainly be said to have been taken out of its breeding range, and *aphrasta* probably is very nearly if not quite resident. An autumnal male from Parral, Chihuahua, Mexico, has a very deep yellow throat, this color also suffusing the entire head and slightly invading the breast below the black jugular crescent, this last, however, something which even breeding birds occasionally exhibit. Examples from the southwestern corner of New Mexico (Grant County, etc.), are intermediate between *leucolæma* and *aphrasta*, but appear to be nearer the latter. Occasional specimens from this region are almost indistinguishable from *leucansiptila*, but have usually somewhat darker backs. To the southward, in the State of Durango, Mexico (specimens from Durango City), the birds are more reddish again, approaching the appearance of *adusta*. Coming

from an intermediate locality they would be readily classed as intergrades, though nearer *aphrasta*, but coming from the opposite portion of the latter's range, it is evident that no such disposition can be made of them. They are apparently not different enough to warrant separation under a name of their own, so the only course is to consider them aberrant examples of *aphrasta*. It is just such cases as this that render the identification and differentiation of the various horned larks so difficult.

Thirty-eight specimens examined, from the localities mentioned below:

Arizona.—Willcox;* Willow Spring;* Sulphur Spring;* Fort Bowie.*

New Mexico.—Dog Spring, Grant County (United States and Mexican boundary line).*

Chihuahua.—Parral; Playas Valley, near White Water;* White Water;* San Diego;* Chihuahua; Casas Grandes;* Balleza; Mesquite Springs (United States and Mexican boundary line).*

Coahuila.—La Ventura.*

Durango.—Durango.*

OTOCORIS ALPESTRIS PALLIDA Dwight.

Otocoris alpestris pallida DWIGHT, Auk, VII, April, 1890, p. 154 (Townsend, manuscript).—TOWNSEND, Proc. U. S. Nat. Mus., XIII, September, 1890, p. 138.—RIDGWAY, Man. N. Amer. Birds, 2d ed., 1896, p. 599.

Chars. subsp.—Similar to *Otocoris a. aphrasta*, but paler above, the nape less pinkish, the back less dusky.

Measurements (1 male).—Wing, 102 mm.; tail, 69.5 mm.; exposed culmen, 11 mm.; tarsus, 20 mm.; middle toe, 10 mm.

Type locality.—Direction Hill, between Adair Bay and mouth of Rio Colorado, Sonora, Mexico.

Geographical distribution.—Region immediately adjacent to the head of the Gulf of California, Mexico.

Description.—*Adult male in breeding plumage*.—Type, No. 117679, U.S.N.M; Direction Hill, between Adair Bay and the mouth of Rio Colorado, northwestern Sonora, Mexico, March 26, 1889; Charles H. Townsend. Occiput, cervix, bend of wing and upper tail-coverts bright vinaceous cinnamon; back, rump, wings and middle tail-feathers wood brown, the first two with a cinnamon tinge, the feathers of back and rump with somewhat darker centers, the wings and middle rectrices edged with paler; rest of tail brownish black, margined exteriorly with white; crown, horns, lores, cheeks, subauricular region and jugular crescent black; forehead, superciliary stripe, auriculars, chin and throat pale yellow, deepest on the two last; rest of lower surface white, the sides and flanks tinged with cinnamon and obsoletely streaked with dusky.

This desert race seems to be closely allied to *adusta*, from which, however, it may be distinguished by its decidedly paler coloration above and noticeably less reddish back. It may be separated from *ammophila* by its paler, more uniform upper surface, the back being without blackish and the line separating the cervix almost obliterated; from *actia* it is by the same characters still more different; and it differs from *occidentalis* in smaller size, as well as very much lighter coloration of the entire upper surface.

The type of *pallida*, which apparently represents the breeding birds of the region immediately about the head of the Gulf of California, at least on the eastern side, seems to be the only individual properly referable to this subspecies. The two specimens from Santa Rosalia Bay, Lower California, a locality included by Dr. Dwight in his range of *pallida*,¹ seem to belong rather to *actia*, for reasons already given.² The specimens from Magdalena Bay, which he also records as *pallida*, have not been examined, but in all probability they resemble those from Santa Rosalia Bay. Should this prove to be so, *pallida* must, at least for the present, be expunged from the North American list, and its geographical distribution restricted to the neighborhood of the mouth of the Colorado River, in northwestern Sonora, Mexico. How far to the southward along either shore of the Gulf it extends can be of course only conjectured, and is an interesting point for future observations to determine.

OTOCORIS ALPESTRIS LEUCANSIPTILA, new subspecies.

Chars. subsp..—Similar to *Otocoris a. pallida*, but even paler, the cervix and bend of wing much less cinnamonaceous.

Measurements (6 males).—Wing, 100–107 (average, 102.9) mm.; tail, 65–70 (average, 67.9) mm.; exposed culmen, 10.5–12 (average, 11.2) mm.; tarsus, 21–22 (average, 21.3) mm.; middle toe, 10.5–11.5 (average, 11.1) mm.

Type locality.—Yuma, Arizona.

Geographical distribution.—Extreme southwestern Arizona, extreme southeast corner of California, and northeastern Lower California along the international boundary line, north to southern Nevada.

Description.—*Adult male in breeding plumage*.—Type, No. 132970. U.S.N.M.; Yuma, Arizona, March 13, 1894; Mearns and Holzner. Back grayish isabella color, streaked with pale fuscous; rump the same, streaked with sepia; wings and two central tail-feathers pale fuscous, edged with whitish, buffy and ochraceous; rest of tail brownish black, margined exteriorly with white; occiput, cervix, bend of wing and upper tail-coverts very pale vinaceous cinnamon; forepart of crown, horns, cheeks and jugulum black; forehead, superciliary stripe

¹Auk, VII, 1890, p. 155.

²Antea, p. 848.

and auriculars dull white, faintly washed with yellow; throat pale yellow; sides and flanks tinged with cinnamon; rest of lower parts white.

Adult female in breeding plumage.—No. 142166, U.S.N.M., Biological Survey collection; Yuma, Arizona, April 10, 1889; V. Bailey. Upper parts sepia, streaked with buffy, most conspicuously so on occiput; cervix pale cinnamon, streaked with brownish; bend of wing and upper tail-coverts deep pinkish cinnamon; rest of plumage similar to the summer male, except that the black of the head is in the female replaced by brownish and buffy, and the black jugular crescent is smaller.

Adult male in winter plumage.—No. 3652, collection of C. E. Aiken, Coyote Well, San Diego County, California, December 1, 1876; F. Stephens¹. Similar to the breeding dress, but colors of upper parts more blended, this effect produced by the pale buffy or ochraceous tips of the feathers, the pinkish nape being almost entirely obscured; the throat is much more deeply yellow, which color suffuses the ear coverts, forehead, superciliary stripe, and slightly the crown behind the black.

This new race is the palest of all the American horned larks, not excepting *pallida* itself, from which form it further differs in lacking much of the cinnamonous tinge of the upper parts, particularly on the cervix and bend of wing. Other characters distinguishing *leucansiptila* from *actia* and *ammophila* are the more uniform upper surface and the much more pinkish shade of the cervix, upper tail-coverts and bend of wing; from *occidentalis*, the decidedly smaller size; from *adusta*, the conspicuously less reddish upper surface; from *leucolæma*, reduced size and more uniform upper parts. The single female of *leucansiptila* now at hand is difficult to tell from the same sex of *leucolæma* except by its smaller size. *Otocoris a. leucansiptila* is curiously similar to *enthymia* from North Dakota and Assiniboia, differing, however, in being smaller, much more brownish, and more nearly uniform above.

That the form of *Otocoris* inhabiting the region about Yuma, Arizona, together with the contiguous area along the Mexican border, should be so different from that of the mouth of the Colorado River, on the one hand, and *adusta* from the neighborhood of Fort Huachuca, on the other, is one of the surprises developed by the present investigation. Three of the specimens were collected by Dr. Edgar A. Mearns while acting as naturalist of the International Boundary Commission, and none of them were accessible to Dr. Dwight when he wrote his review of the group. Two winter specimens from Ash Meadows, in southern Nevada, though not quite typical of *leucansiptila*, are apparently much nearer this race than to either *ammophila* or *leucolæma*. Whether or not they represent the breeding *Otocoris* of that locality is not at

¹This specimen is not quite typical, verging somewhat toward *actia*.

present determinable. It is quite probable, however, that this will ultimately prove to be the case, for the region intervening between the known range of *leucansiptila* and southern Nevada is generally similar to that along the Mexican boundary, and of the breeding horned larks from this area we as yet know practically nothing.

Eleven specimens have been examined, representing the localities that follow:

Arizona.—Yuma.*

California.—Coyote Well, San Diego County.

Nevada.—Ash Meadows.

Lower California.—Gardners Lagoon;* Colorado River at Monument 204 (United States and Mexican boundary line).

OTOCORIS ATLAS Whitaker.

Otocorys atlas WHITAKER, Bull. Brit. Orn. Club, VII, No. LIII, 1898, p. xlvii; Ibis, 1898, p. 604, pl. XIII.

Chars. sp.—Similar to *Otocoris alpestris flava*, but the nape much more rufescent, the throat and superciliary stripe paler, the horns longer.

Measurements.—Male: wing, 111.2 mm.; culmen, 15 mm.; tarsus, 20 mm. Female: wing, 102.5 mm.; culmen, 12.5 mm.; tarsus, 17.5 mm.

Type locality.—Glaoui,¹ Great Atlas Mountains, Morocco.

Geographical distribution.—Atlas Mountains, Morocco.

Description.—"Adult male. Resembles *O. elwesi*, but differs from that species in having the upper wing-coverts of a uniform sandy-brown colour, the same as the back, and not vinaceous, while the hind crown and nape are of a rich rufescent hue, and the upper throat of a pale sulphur colour. The black of the lower throat and of the cheeks is distinctly separated by a yellowish-white patch, as in *O. alpestris*, while the general colour of the upper parts, the black band over the base of the bill, the bill itself, and the long hornlets are all as in *O. penicillata*. Iris brown; bill grayish black; legs black."²

"Adult female.—General colour as in male, but wanting the black band on fore crown; the dark cheek-patch but faintly marked; black hornlets much shorter; lores and narrow streak over base of bill brownish instead of black; frontal light band soiled yellowish; crown streaked with dark brown; hind neck slightly rufescent. Soft parts as in male."³

This *Otocoris* differs from all the forms of both *O. penicillata* and *O. longirostris* in having a yellow throat, and additionally from the former in having the black of the jugulum separated from that of the

¹ In the original description given as Glani, but this is evident a mistake.

² Whitaker, Ibis, 1898, pp. 604-605.

³ Idem, p. 605.

auriculars. Although considered by its describer to be nearest *penicillata*, it undoubtedly is most closely allied to *alpestris*, being in fact possibly but a subspecies.

OTOCORIS LONGIROSTRIS LONGIROSTRIS Moore.

Otocoris longirostris MOORE, Proc. Zool. Soc. Lond., 1855, p. 215 (Gould, manuscript).

Otocorys longirostris SHARPE, Cat. Birds Brit. Mus., XIII, 1890, p. 536 (part).

Chars. sp..—Similar to *Otocoris alpestris flava*, but differs in being very much larger, noticeably paler and more grayish, and in lacking any decided tinge of yellow about the head or throat.

Measurements (two males).—Wing, 127.5–134 (average, 130.8) mm.; tail, 93–95 (average, 94) mm.; exposed culmen, 14–16 (average, 15) mm.; tarsus, 23–24 (average, 23.5) mm.; middle toe, 13.5 mm.

Type locality.—Vicinity of Agra, northern India.

Geographical distribution.—In summer, Cashmere; in winter, south to northern India.

Description.—*Adult male in breeding plumage*.—No. 150216, U.S.N.M.; Namika-la Pass, Cashmere, June 26, 1893; Dr. W. L. Abbott. Back, wings and middle tail-feathers sepia, the back streaked with buffy, the wings and middle tail-feathers margined with the same; rest of tail brownish black, the outer pair of feathers white on outer webs; cervix and bend of wing deep pinkish vinaceous; occiput and upper tail-coverts pinkish cinnamon; crown, horns, lores, cheeks and jugulum black; forehead, superciliary stripe, auriculars, subauricular region, chin, throat and rest of lower surface white, the sides and flanks tinged with cinnamon buff.

Adult male in winter plumage.—No. 125528, U.S.N.M.; Central Cashmere, September 23, 1891; Dr. W. L. Abbott. Similar to the summer dress, but almost uniform grayish ochraceous above, the black areas much obscured, and the sides of body more deeply shaded with cinnamon.

Although commonly treated as a subspecies of *elwesi*, the present form should stand as the typical one, having been described long before any of its subspecific relatives. The name *longirostris* undoubtedly applies to the very large bird which summers in Cashmere, as a careful examination of the original description shows. There is an apparent discrepancy about the type locality, for Moore gives as the range of his then new species simply the vicinity of Agra, which place apparently must be considered the type locality, although Dr. Sharpe catalogues¹ as the “types of *O. longirostris*” a number of specimens collected by Major Hay in Kulu.

The present species is apparently quite distinct from *Otocoris alpestris*, but among its various subspecies there is such a striking parallel

¹Cat. Birds Brit. Mus., XIII, 1890, p. 536.

development, particularly of the desert forms, that scarcely any one character will serve to distinguish all its races from all those of *alpestris*.

All the forms of *Otocoris longirostris* may be readily separated from *Otocoris alpestris flava*, the only form of *Otocoris alpestris* that occurs in Asia, by their much paler, more grayish coloration, and at all seasons by the entire absence of yellow on either head or throat. The present race, typical *longirostris*, is the giant of the genus, exceeding in size every other form, Old World or American. In general tone of coloration above it is neither very light nor very dark.

An adult male from Namika-la-Pass, Cashmere, is considerably smaller in most of its dimensions than a specimen from Central Cashmere, but has a decidedly longer bill. Allowing for difference of season there is apparently no significant contrast in color.

OTOCORIS LONGIROSTRIS ELWESI (Blanford).

Otocoris elwesi BLANFORD, Journ. As. Soc. Bengal, 1872, p. 62.

Otocorys nigrifrons PREJEWALSKY, "Mong. and Thibet, II, 1876, p. 103."

Otocorys teleschowi PREJEWALSKY, Ibis, 1887, p. 416.

Otocorys elwesi SHARPE, Cat. Birds. Brit. Mus., XIII, 1890, p. 534 (part).

Chars. subsp.—Resembling *Otocoris longirostris longirostris*, but decidedly smaller and less grayish on the upper surface, particularly in winter.

Measurements (two males).—Wing, 116.5–117.5 (average, 117) mm.; tail, 80–81 (average, 80.5) mm.; exposed culmen, 10–10.5 (average, 10.3) mm.; tarsus, 22.5–23.5 (average, 23) mm.; middle toe, 11.5 mm.

Type locality.—Kangra Lama Pass, Sikhim.

Geographical distribution.—Thibet, including the northern and southern borders.

Description.—*Adult male (type).*—"Narrow frontal band, lores, sides of head below the eye, and a band running back below the ear coverts, but not extending down the sides of the neck, crown of the head, two sincipital tufts, and the upper part of the breast black; forehead above the black band, broad supercilia running back from it, with the ear coverts, sides of the neck intervening between the black of the cheeks and that of the breast, throat lower breast and abdomen white, nape, back of neck, rump and wing coverts pale greyish lilac; back pale fulvous brown with narrow dusky central stripes to the feathers, upper tail coverts long, pale brown with narrow central stripes and whitish edges; quills brown, the first primary with a white outer web, remaining primaries with narrow isabelline edges and tips which become white on the secondaries, the three last quills (tertiaries) and the central tail feathers brown with broad fulvous margins, the other tail feathers blackish with very narrow pale tips which can only be apparent in a freshly moulted specimen, the two outer rectrices on each side edged and tipped with white, most broadly on the outermost in which nearly the whole outer web is white; wing lining white;

flanks fulvous; bill black above, pale near the base below; legs black, soles of feet yellowish.”¹

Adult male in winter plumage.—No. 101985, U.S.N.M.; Sikkim, India, 1874. Back, wings and middle tail-feathers fuscous, all the feathers margined with ochraceous or buffy ochraceous; rest of tail brownish black, the outer feathers edged exteriorly with white; occiput, cervix and bend of wing pinkish vinaceous, the two first streaked and clouded with brownish; upper tail-coverts deep vinaceous cinnamon; forehead, superciliary stripe, part of auriculars, chin, throat, and under surface, except jugulum, white, shaded with cinnamon on sides and flanks, spotted with dusky on breast; crown, horns, lores, cheeks and jugulum black, more or less obscured by grayish tips of the feathers.

Adult female in winter plumage.—No. 101986, U.S.N.M.; Darjeeling, India, 1874. Similar to the male, but more ochraceous above, the occiput, cervix and upper tail-coverts deep cinnamon ochraceous, streaked with brown; black of head either much mixed with ochraceous or replaced by brownish.

Of the two names here treated as synonyms of *elwesi*, the first, *Otocorys nigrifrons* Prejewalsky, has not been verified and is therefore somewhat doubtfully identical. The other, *Otocorys teleschowi* Prejewalsky, from northwestern Tibet, is possibly separable as a race, but with our scanty material we are unable to settle the question. In fact the dimensions Prejewalsky gives are more nearly those of *sibirica* than of *elwesi*, but unless the name is based on winter specimens from a more northern home, it is probably correctly located near or under the present subspecies.

This race of the eastern Himalayas differs from *longirostris* in its much inferior size and rather lighter more ochraceous colors, particularly on the upper surface. In winter dress the spotting of the breast is much more pronounced.

As with most of the Old World forms of *Otocoris* the series at hand is too limited to render satisfactory any comparisons of individual variations. These are, however, probably much the same as obtain throughout the genus.

Available material is lacking to establish the precise limits of the distribution of *elwesi* to the westward along the Himalayas; or to the northward beyond the mountains of northern Tibet, if indeed it reaches the latter region.

OTOCORIS LONGIROSTRIS PERISSA, new subspecies.

Otocorys longirostris SHARPE, Cat. Birds Brit. Mus., XIII, 1890, p. 536 (part).

Chars. subsp.—Similar to *Otocoris l. elwesi*, but much larger, and more rufescent above.

¹ Blanford, Journ. As. Soc. Bengal, 1872, p. 62.

Measurements (3 males).—Wing, 120.5–125 (average, 123.5) mm.; tail, 87–90 (average, 88.3) mm.; exposed culmen, 12.5–14 (average, 13.3) mm.; tarsus, 21.5–23.5 (average, 22.8) mm.; middle toe, 11–13 (average, 11.8) mm.

Type locality.—Tsokr Chumo Lake, Ladak.

Geographical distribution.—Ladak, central Asia.

Description.—*Adult male in breeding plumage.*—Type, No. 162845, U.S.N.M.; Tsokr Chumo Lake, Ladak, July 11, 1897; Dr. W. L. Abbott. Back cinnamon, with a rufescent tinge; wings and middle pair of tail-feathers fuscous, edged with buffy and cinnamon buff; occiput, cervix, bend of wing and upper tail-coverts pinkish vinaceous, palest on the last; crown, horns, lores, cheeks and jugulum black; forehead, superciliary stripe, auriculars, chin, throat and rest of lower surface white, the sides shaded with cinnamon and streaked with dusky.

Adult female in breeding plumage.—No. 162844, U.S.N.M.; Fotu-la Pass, Ladak, 1897; Dr. W. L. Abbott. Back, rump, wings and middle tail-feathers sepia, the feathers all margined with buffy; cervix pale pinkish buff, streaked with sepia; upper tail-coverts cinnamon, with a pinkish tinge; black of crown mixed with buffy; auriculars grayish; otherwise like the breeding male.

Adult male in winter plumage.—No. 112625, U.S.N.M.; Jouttak, Ladak, September 15; J. Biddulph. Similar to the breeding male, but upper parts more uniform and much more grayish, the occiput, cervix and bend of wing more pinkish; the black of head obscured, and the breast slightly spotted with dusky.

Young in first plumage.—No. 150217, U.S.N.M.; Khardong Pass, Ladak, July 13, 1893; Dr. W. L. Abbott. Upper parts clay color, each feather with a subterminal bar of sepia and a terminal spot of buffy; wings and tail sepia, margined with buffy white and ochraceous buff; sides of head mixed brownish and dull pale yellowish; chin and throat yellowish white; jugulum, breast and sides of body yellowish white, streaked and spotted with dark brown.

Though heretofore always confused with *longirostris*, this new race may be distinguished from that form by its smaller size and more ochraceous or rufescent coloration above. In winter *perissa* is apparently rather darker than *longirostris*. From *elwesi* the present race differs in being larger, considerably paler, and somewhat more grayish above. That neither this nor the following subspecies (*O. l. argalea*) is the same as *Otocoris teleschowi* Prejewalsky may at once be seen by a comparison of measurements.

This is the only form of either *penicillata* or *longirostris* of which the young in first plumage is available for comparison. A single specimen from Khardong Pass, Ladak, is here considered as belonging probably to *perissa*, though no adults from the same place have been examined. Compared with the young of *Otocoris alpestris alpestris*,

which it seems most closely to resemble, it differs in being much paler, more grayish above; the light buffy markings on head, back, rump and wings are broader and more conspicuous; the breast is much less yellowish, its dark spots smaller; the abdomen is almost pure white, and the throat has only a faint wash of yellow.

The type of *perissa* is larger, darker on the cervix, and somewhat more reddish on the back than a similar specimen from Debring (Rupshu), Ladak, but these differences are probably not more than individual.

OTOCORIS LONGIROSTRIS ARGALEA, new subspecies.

Chars. subsp.—Resembling *Otocoris l. perissa*, but very much paler and more cinnameous above.

Measurements (one male).—Wing, 124 mm.; tail, 85 mm.; exposed culmen, 12 mm.; tarsus, 23 mm.; middle toe, 12 mm.

Type locality.—Suget Pass, Kuen Lun Mountains, Chinese (Eastern) Turkestan.

Geographical distribution.—Southwestern portion of Eastern Turkestan.

Description.—*Adult male in breeding plumage.*—Type, No. 150218, U.S.N.M.; Suget Pass, Kuen Lun mountains, Eastern Turkestan, July 28, 1893; Dr. W. L. Abbott. Upper parts pale buffy fawn color, the rump streaked with dark brown; occiput, cervix, bend of wing and upper tail-coverts pale pinkish vinaceous, the hind part of crown whitish; wings and middle pair of tail-feathers fuscous, edged with color of back; rest of tail black, the outer feathers margined exteriorly with white; fore part of crown, horns, lores, cheeks and jugulum black; forehead, superciliary stripe, auriculars, chin, throat and remainder of lower parts white, the sides and flanks tinged with cinnamon.

A single adult breeding male from Suget Pass, in the Kuen Lun Mountains, Eastern Turkestan, differs so materially from the other forms of this species here recognized as to render almost certain the conviction that it represents an undescribed subspecies, which probably inhabits at least the southwest portion of the arid plateau of Eastern Turkestan. In color it most closely approaches *sibirica*, being, however, considerably darker and less uniform above, the cervix and back more cinnameous. It is, moreover, very much larger. *Otocoris l. argalea* is therefore a very pale edition of *perissa*, with the pinkish and rufescent areas of the latter much tinged with cinnameous. From *longirostris* it may be distinguished at sight by its very much lighter colored, more uniform upper surface, as well as by its inferior size. From *elwesi* it differs in larger size and paler upper surface.

OTOCORIS LONGIROSTRIS SIBIRICA (Swinhoe).

Otocorys sibirica SWINHOE, Proc. Zool. Soc. Lond., 1871, p. 390.

Otocorys albigula auct. (not of Bonaparte).

Otocorys brandti DRESSER, Birds Europe, IV, 1874, p. 397.—SHARPE, Cat. Birds Brit. Mus., XIII, 1890, p. 536.

Otocorys parvexi TACZANOWSKI, Bull. Soc. Zool. France, I, 1876, p. 161.

Chars. subsp.—Similar to *Otocoris l. argalea*, but much smaller, the upper surface paler and more grayish.

Measurements (2 males).—Wing, 108–111 (average, 109.5) mm.; tail, 75–76 (average, 75.5) mm.; exposed culmen, 11 mm.; tarsus, 21–22.5 (average, 21.8) mm.; middle toe, 12–12.5 (average, 12.3) mm.

Type locality.—Pekin, China (winter).

Geographical distribution.—In summer, Mongolia and southern Siberia west of the Amoor River; in winter, south to southeastern Russia, Turkestan, Eastern Turkestan and northern China.

Description.—*Adult male in breeding plumage.*—No. 101984, U.S.N.M.; Kasolinse, Turkestan, 1878. Back, scapulars and rump almost uniform pale dull ochraceous buff, the feathers with rather darker centers; wings and middle pair of feathers fuscous, edged with color of back; rest of tail brownish black, the outer feathers margined exteriorly with white; upper tail-coverts pale cinnamon buff; occiput, cervix and bend of wing ecru drab; fore part of crown, horns, lores, cheeks and jugulum black; forehead, superciliary stripe, auriculars, chin, throat and remainder of lower surface white, the sides washed with cinnamon.

Adult female in breeding plumage.—No. 100226, U.S.N.M.; Kirghis Steppes, Siberia, February 3, 1880.—Much like the breeding male, but back darker and less uniform; occiput and cervix pale buffy with scarcely any pinkish tinge, and narrowly streaked with dark brown; black of head considerably mixed with grayish, or replaced by brownish.

Adult male in winter plumage.—No. 114660, U.S.N.M.; Katun Karagai, Siberia, December, 1881; Dr. Rey.—Similar to the summer male, but darker, decidedly more grayish above; the black areas somewhat obscured by grayish.

The specific name *albigula*, so long applied to this horned lark, dates from Bonaparte,¹ since the *Alauda albigula* of Brandt seems not to have been previously described. To whatever the latter's name may have referred, there is now no doubt that the name *albigula* Bonaparte is to be considered a synonym of *O. penicillata*, as already shown by Dr. Dubois² and by Dr. Sharpe,³ as well as by Mr. Dresser.⁴ The earliest name for the present race is apparently *Oto-*

¹ Consp. Avium, I, 1850, p. 246.

² Bull. Mus. Royal d'Hist. Nat. Belgique, III, 1884, pp. 225, 229.

³ Cat. Birds Brit. Mus., XIII, 1890, p. 536; see also under *Otocoris penicillata*.

⁴ Birds Europe, IV, 1874, p. 397.

corys sibirica Swinhoe, ostensibly adopted by him from Eversmann, but so far as it has been possible to ascertain Eversmann had never published this name. Although Dr. Sharpe¹ synonymizes it with *elwesi*, it undoubtedly refers to the form called by him *brandti*. Mr. Swinhoe, after describing the bird by comparison with *O. alpestris*, says of it: "Sedentary and abundant in the high regions of Mongolia, whence it descends to Peking in small numbers. This pretty lark loves the neighbourhood of the Mongol tents in winter."² Since the resident form of Mongolia—if, indeed, not entitled to separate subspecific distinction, as appears quite probable—is evidently nearer the bird from the region just south of Lake Baikal than it is to that of the Himalayas, the name which applies to it must be used for the Baikal form together with all else identical. The Baikal bird (from Dauria and Kiachta) has been named *parvexi* by Taczanowski,³ and this by the adoption of the view above expressed becomes a synonym of *sibirica* Swinhoe. The form from the Kirghis Steppes in western Siberia, described by Dresser as *Otocorys brandti*,⁴ is apparently larger than that from Dauria, and a good series would probably serve to establish its claim to recognition, but otherwise it must be added to the synonymy of *sibirica*. The name *Otocorys petrophila*⁵ is commonly cited under this form, but though referring apparently to the bird from the Tian Shan Mountains, it is clearly a *nomen nudum*, and is entitled to no consideration.

This is the smallest and palest of the forms of *longirostris*, and may readily be identified by these characters. In size it is not so different from *elwesi* as from the others, but still is usually considerably smaller. Winter specimens occasionally in color resemble *longirostris* and *perissa*, but in such cases size is an infallible test.

An adult winter male from Katun Karagai, Siberia, apparently belongs to this race, though it is considerably darker and more grayish above than the two other specimens.

OTOCORIS BILOPHA (Temminck).

Alauda bilopha TEMMINCK, Pl. Col., III, 1823, pl. ccxlv, fig. 1.

Otocoris bilopha BONAPARTE, Conspectus Avium, I, 1850, p. 246.

Otocorys bilopha SHARPE, Cat. Birds Brit. Mus., XIII, 1890, p. 537.

Chars. sp.—Similar to *Otocoris longirostris sibirica*, but smaller, the upper surface very much more fulvescent.

Measurements (one male).—Wing, 96.3 mm.; tail, 60 mm.; culmen, 13.8 mm.; tarsus, 20 mm.

Type locality.—El Akaba, southwestern Turkey in Asia.

¹ Cat. Birds Brit. Mus., XIII, 1890, p. 534.

² Proc. Zool. Soc. Lond., 1871, p. 390.

³ Bull. Soc. Zool. France, I, 1876, p. 161.

⁴ Birds Europe, IV, 1874, p. 401.

⁵ Severtzow, Journ. f. Orn., 1873, p. 379.

Geographical distribution.—Northwestern Arabia, with adjacent part of Turkey in Asia; Algeria; Morocco; casual in southeastern Spain (Valencia).

Description.—*Adult male.*—"Entirely bright sandy rufous above, with a vinous shade, and with darker rufous shaft-lines to some of the dorsal feathers; wing-coverts entirely sandy rufous like the back; quills dusky brown, externally sandy rufous and edged with white at the ends, the inner secondaries entirely sandy rufous, the first primary externally edged with white; centre tail-feathers sandy rufous with black shaft stripes, the remainder black, the penultimate feather edged with white near the end of the outer web, the outermost one white for nearly the whole extent of the outer web; crown of head sandy rufous like the back, with a vinous tinge; forehead and eyebrow white, succeeded by a broad band of black across the fore part of the crown, continued into two long ear-tufts above the ear-coverts and reaching to the sides of the nape; nasal plumes, lores, feathers below the eye, fore part of ear-coverts black, this black patch extending down the centre of the cheeks; hinder ear-coverts and adjacent sides of neck, as well as the remainder of the cheeks and throat, white; a very broad crescentic band of black on the lower throat and fore neck; remainder of under surface from the chest downwards white, the sides of the breast vinous-sandy, and the sides of the body and thighs washed with vinous; under wing-coverts and axillaries white, the edge of the wing sandy; quills dusky below, ashy isabelline along the inner web: 'bill dusky horn-colour, paler on the mandible; feet pale dusky horn-colour.'

"In breeding-plumage the vinaceous colour of the upper parts becomes obliterated and the back is of a rufous-sandy colour; the head sometimes shows a white band behind the black frontal one."¹

Otocoris bilopha seems most nearly related to the *longirostris* group, but is less in size than any of these, and is further distinguished by its uniform fulvescent buffy upper surface.

The birds from Arabia are very possibly not the same as those from Algeria, particularly as their range does not seem to be continuous.

OTOCORIS PENICILLATA PENICILLATA (Gould).

Alauda penicillata GOULD, Proc. Zool. Soc. Lond., 1837, p. 126.

Otocoris penicillata GRAY, Genera Birds, II, 1844, p. 382, pl. XI.

Otocoris scriba BONAPARTE, Conspectus Avium, I, 1850, p. 246.

Otocoris albigula BONAPARTE, Conspectus Avium, I, 1850, p. 246.

Otocoris larvata DE FILIPPI, Arch. Zool. Anat. and Phys., II, 1863, p. 382.

Otocorys penicillata SHARPE, Cat. Birds Brit. Mus., XIII, 1890, p. 530.

Otocorys penicillata transcaspica FLÖRICKE, Die gefiederte Welt, 1898, p. 46.

Otocorys penicillata iranica ZARUDNY and HÄRMS, Orn. Monatsber., 1902, p. 53.

Chars. subsp.—Resembling *Otocoris longirostris longirostris*, but very much smaller, the black of the auriculars continuous with that of the jugulum.

¹Sharpe, Cat. Birds Brit. Mus., XIII, 1890, p. 538.

Measurements (two males).—Wing, 116–118.5 (average, 117.3) mm.; tail, 80–82 (average, 81) mm.; exposed culmen, 11–13 (average, 12) mm.; tarsus, 22.5–23 (average, 22.8) mm.; middle toe, 12.5–13.5 (average, 13) mm.

Type locality.—Erzeroum, Asia Minor.

Geographical distribution.—Asia Minor, the Caucasus and Persia, to Afghanistan and Baltistan, Central Asia.

Description.—*Adult male in breeding plumage.*—No. 101982, U.S.N.M.; Bereketti, Taurus, Asia Minor, April 30, 1876; C. G. Danford. Upper parts drab gray, the feathers with dark brown centers; upper tail-coverts chiefly ecru drab; occiput and cervix dull, deep vinaceous, this color slightly tinging the bend of the wing; wings fuscous, margined with the color of the back; middle pair of tail-feathers fuscous, edged with paler; rest of tail black, the two outer pairs of feathers with white external margins; crown, long horns, lores, cheeks, sides of throat, lower throat and jugulum black; forehead, superciliary stripe, chin, center of throat and remainder of lower surface white, the sides of the body washed with buffy and obscurely streaked with dusky.

Adult male in winter plumage.—No. 126852, U.S.N.M.; Skardu, Baltistan, January 28, 1892; Dr. W. L. Abbott. Very much like the summer dress, but more uniform above, the vinaceous of occiput and cervix being entirely covered by grayish like the back; black areas obscured by grayish.

Adult female.—"Wants the black band across the crown, the head and back being very distinctly streaked with blackish brown; the whole general appearance of the bird more dusky than in the male."¹

The *Otocoris scriba* of Bonaparte² is a pure synonym of *penicillata* Gould, having been obtained at the type locality;³ and a similar fate apparently attends *Otocoris larvata* De Filippi,⁴ from Persia. With regard to *Otocoris albigula* Bonaparte,² of which mention has already been made under *Otocoris l. sibirica*, and which, judging even by the original description, can apply only to some form of *penicillata*, Dr. O. Finsch has, by request, very kindly furnished the following particulars: "To this species [*O. penicillata*] belongs, without doubt, *Otocoris albigula* Bp. Consp., p. 246 (ex Alp. Russ. As.), based on the specimen in our museum, which bears by Temminck's own handwriting the label, 'Alauda albigula Brandt, par le Mus. St.-Petersbourg, Alpes de Russien' * * * It agrees very well with the figure cited above [Gray, Genera of Birds, II, pl. 92], and has, so far as I can judge from the description, nothing to do with Reichenow's *Otocoris penicillata balcanica*."

¹Sharpe, Cat. Birds Brit. Mus., XIII, 1890, p. 531.

²Consp. Avium, I, 1850, p. 246.

³See Severtzow, Ibis, 1883, p. 61.

⁴Arch. Zool. Anat. and Phys., II, 1863, p. 382.

Although "Alpes de Russien" is rather an indefinite locality, it seems most probable that the reference is to the mountains of the Caucasus, where the bird is well known to occur.

Otocoris penicillata with its various races differs from all the other horned larks, except *berlepschi*, in having the throat completely encircled by black—that is, the black of the cheeks not separated from that of the jugulum by a white area. The horns of this species are, moreover, much longer than in *longirostris* or *alpestris*. Typical *penicillata* is, excepting *balkanica*, apparently the darkest and most grayish race.

A winter male from Skardu, Baltistan, is rather more ochraceous throughout the upper parts than a specimen from the Taurus Mountains, Asia Minor, near the type locality, being thus to a degree intermediate between *penicillata* and *oreodrama*, though very much nearer the former. Good series of specimens from both Baltistan and Asia Minor might show the bird from the former locality to be a recognizable subspecies, whose name would probably be *larvata* De Filippi.

OTOCORIS PENICILLATA BALKANICA Reichenow.

Otocorys penicillata balkanica REICHENOW, Ornith. Monatsber., III, 1895, p. 42.

Chars. subsp.—Like *Otocoris penicillata penicillata*, but considerably darker above.¹

Type locality.—Bosnia.²

Geographical distribution.—The Balkan Peninsula, southern Europe.

In the original account of this form no detailed description is given, and as no specimens have been available, none can be presented here. The essential portions of Dr. Reichenow's diagnosis follow:

Sie unterscheidet sich von der typischen *O. penicillata* insbesondere durch intensivere weinröthliche Färbung des Hinterkopfes und Nackens und dunkleren graubraunen Ton des Rückens und der Flügel. Ferner ist der Schnabel im allgemeinen etwas länger und die schwarze Stirnbinde wie die Kropfbinde breiter.

From this it seems to be a recognizable race, though closely allied to *Otocoris penicillata penicillata*, differing principally in the deeper colors of the upper surface.

The records of *Otocoris penicillata* in Europe³ doubtless belong here.

OTOCORIS PENICILLATA OREODRAMA, new subspecies.

Otocorys pallida SHARPE, Cat. Birds Brit. Mus., XIII, 1890, p. 533 (part, not of Dwight).

Otocorys diluta SHARPE, Cat. Birds Brit. Mus., XIII, 1890, p. 670 (part).

Chars. subsp.—Similar to *Otocoris penicillata penicillata*, but slightly paler, more uniform above, as well as very much more cinnameous.

¹ Dr. Reichenow (Ornith. Monatsber., III, 1895, p. 42) gives no measurements, but states that the bill is rather longer than in true *O. penicillata*.

² Dr. Reichenow in a letter says that his type specimens came from here.

³ Reiser, Ornith. Jahrbuch, 1890, p. 106.

Measurements (2 males).—Wing, 115–118 (average, 116.5) mm.; tail, 83–87.5 (average, 85.3) mm.; exposed culmen, 10–11 (average, 10.5) mm.; tarsus, 21–23.5 (average, 22.3) mm.; middle toe, 12–12.5 (average, 12.3) mm.

Type locality.—Tagdumbash Pamir, central Asia.

Geographical distribution.—In summer, Tagdumbash Pamir, and probably Ferghana; in winter, extending to the western portion of Eastern Turkestan.

Description.—*Adult male in breeding plumage.*—Type, No. 150222, U.S.N.M.; Tagdumbash Pamir, central Asia, June 16, 1894; Dr. W. L. Abbott. Back and rump dull grayish ochraceous, streaked with dark brown; upper tail-coverts cinnamon, with pinkish tinge, the longer ones with darker centers; occiput, cervix and bend of wing deep vinaceous; wings and two middle tail-feathers fuscous, margined with the color of the back, the tips of the secondaries broadly white; rest of tail black, the outer feathers white on exterior webs; crown, horns, nasal plumes, lores, cheeks, sides of throat, and jugulum black; forehead, superciliary stripe, auriculars, chin, center of throat and rest of lower parts white, the sides tinged with cinnamon.

Adult male in winter plumage.—No. 112624, U.S.N.M.; Kashgar, Eastern Turkestan, December, 1873; J. Biddulph. Similar to the summer male, but upper surface more uniform and more grayish; cervix more pinkish; black areas obscured by grayish.

Adult female in winter plumage.—No. 150223, U.S.N.M.; Turngart Pass, Tian Shan Mountains, central Asia, September 20, 1893; Dr. W. L. Abbott.—Resembling the winter male, but more ochraceous above, the nape less pinkish, the black of head mixed with grayish and ochraceous, the breast washed with buff and spotted obsoletely with dusky.

This form has heretofore been confounded with *penicillata* or *diluta*, or both, and though to some extent intermediate between these two, is easily recognizable upon comparison. It seems to be nearest *penicillata*, from which it differs in the slightly paler, more uniform upper surface, and in the strongly cinnamomeous shade of the same parts, the exposed surface of the upper tail-coverts being cinnamon, instead of pinkish vinaceous. From *bicornis* it may be distinguished by its larger size, less uniform upper parts, more pinkish nape and occiput, and much more grayish coloration.

OTOCORIS PENICILLATA DILUTA (Sharpe).

Otocorys pallida SHARPE, Cat. Birds Brit. Mus., XIII, 1890, p. 533 (not of Dwight).

Otocorys diluta SHARPE, Cat. Birds Brit. Mus., XIII, 1890, p. 670.

Otocoris penicillata diluta RICHMOND, Proc. U.S. Nat. Mus., XVIII, 1895, p. 578 (part).

Chars. subsp.—Resembling *Otocoris penicillata oreodrama* but decidedly paler, more buffy on the upper surface.

Measurements (1 male).—Wing, 120 mm.; tail, 82 mm.; exposed culmen, 11.5; tarsus, 22 mm.; middle toe, 12 mm.

Type locality.—Kashgar, Eastern Turkestan.¹

Geographical distribution.—Western part of Eastern Turkestan.

Description.—*Adult male in breeding plumage.*—No. 150221, U.S.N.M.; Bulan Kul, Eastern Turkestan, April 2, 1894; Dr. W. L. Abbott. Back, scapulars, rump and upper tail-coverts uniform pale cinnamon buff, with ill-defined shaft lines of brown, the rump with a pinkish tinge; occiput, cervix and bend of wing ecru drab; wings and middle pair of tail-feathers fuscous, the latter and the innermost secondaries broadly margined with the color of the back, the remainder of the wings edged with buffy and whitish; rest of tail black, the outermost feathers margined on exterior webs with white; crown, horns, lores, cheeks, sides of throat, lower throat and jugulum black; forehead, superciliary stripe, auriculars, chin, center of throat and rest of lower surface white, the sides of body tinged with cinnamon.

Adult female in breeding plumage.—No. 150219, U.S.N.M.; Bulan Kul, Eastern Turkestan, April 1, 1894; Dr. W. L. Abbott. Similar to the male, but back and rump with much admixture of dark brown; the cervix ochraceous buff, obsoletely streaked with dark brown; bend of wing with but little tinge of pinkish; crown dull ochraceous buff, streaked with blackish; auriculars buffy; black of cheeks much mixed with buffy and grayish.

Readily distinguished from both *penicillata* and *oreodrama* by its much paler and much more buffy upper parts, the back being almost uniform pale cinnamon buff. It differs from *bicornis* in larger size, paler upper parts, more pinkish occiput, cervix, bend of wing and superior tail-coverts. Females of *diluta* may be separated from females of the other races of *penicillata* by their paler, more buffy coloration.

OTOCORIS PENICILLATA BICORNIS (Brehm).

Phileremos bicornis BREHM, Vogelfang, 1855, p. 122 (Hemprich manuscript).

Otocorys bicornis SHARPE, Cat. Birds Brit. Mus., XIII, 1890, p. 532.

Otocorys penicillata var. *bicornis* DUBOIS, Synopsis Avium, Pt. 7, 1901, p. 451.

Chars. subsp.—Similar to *Otocoris p. diluta*, but smaller and rather darker; the cervix, bend of wing and upper tail-coverts more cinnamonaceous.

Measurements (3 males).—Wing, 110–112.5 (average, 111.5) mm.; tail, 67.5–72.5 (average, 70.7) mm.; exposed culmen, 14–15 (average, 14.5) mm.; tarsus, 20–23 (average, 21.4) mm.; middle toe, 12.5 mm.

Type locality.—Syria.

Geographical distribution.—Syria and northern Palestine.

¹ Dr. Sharpe, through Mr. C. Chubb, has kindly furnished this information regarding the type locality.

Description.—*Adult male in breeding plumage.*—No. 37837, U.S.N.M.; Mount Hermon, Palestine, June 4, 1864. Upper surface dull ochraceous, the feathers with dull brown centers; upper tail-coverts cinnamon; occiput, cervix and extreme bend of wing dull pinkish vinaceous; wings and middle tail-feathers fuscous, margined with buffy and ochraceous; rest of tail brownish black, the outer feathers edged outwardly with white; fore part of crown, horns, lores, cheeks, sides of throat, lower throat and jugulum black; forehead, superciliary stripe, auriculars, chin, center of throat and rest of lower parts white, the sides tinged with cinnamon.

Adult female in breeding plumage.—No. 37835, U.S.N.M.; summit of Mount Hermon, Palestine, June 2, 1864. Similar to the summer male, but rather darker, duller and more uniform above, the cervix less pinkish, the black of crown much mixed with dull ochraceous.

Dr. Sharpe says¹ that Hemprich's *Alauda bicornis*, which was current so long as a mere manuscript or label name, had never been published, and he adopts it² as the designation of the present race, the one, as Dr. Sharpe himself shows, to which it undoubtedly refers. But the *Phileremos bicornis* of Brehm,³ which Dr. Sharpe quotes under *Otocoris bilopha*, is with equal certainty applicable to the same bird, as a careful examination of the description proves.⁴ Brehm here adopts Hemprich's name, and notes in addition that other authors have referred *Alauda bicornis* to *Alauda bilopha*. Moreover, the description and locality apply much better to the present bird than to *Otocoris bilopha*.

The few available examples of this bird are in very much worn summer plumage, but are sufficient to indicate that *bicornis* is an excellent race. It differs from *penicillata* in smaller size, and in the more uniform cinnamonaceous and ochraceous colors of the upper parts.

OTOCORIS BERLEPSCHI Hartert.

Otocoris berlepschi HARTERT, Journ. f. Orn., 1890, p. 103; Kat. Vogelsamml. Senkenburg, 1891, p. 37.

Otocorys berlepschi HARTERT, Ibis, 1892, p. 522, pl. XIII.

Chars. sp.—Nearest *Otocoris penicillata penicillata*, but very different by reason of its entirely black chin and throat, together with its cinnamonaceous breast, abdomen, and upper surface.

Measurements (type).—Wing, 106 mm.; tail, 70 mm.; culmen, 12 mm.; tarsus, 22 mm.

¹ Cat. Birds Brit. Mus., XIII, 1890, p. 532.

² Idem.

³ Vogelfang, 1855, p. 122.

⁴ This is as follows: "(3) Die langhörnige Wustenberglärche, *Phileremos bicornis*, Brm. (*Alauda bicornis*, Hemp. A. *bilopha*, auct.). Der Schnabel und die Hörner sind viel länger als bei Nr. 1 [= *Phileremos alpestris* = *Otocoris alpestris flava*] und 2 [= *Phileremos rufescens* = *O. a. flava*] und ihre Kehle weisslich; kommt wahrscheinlich aus Syrien nach den griechischen Inseln."

Type locality.—Caffraria, South Africa.

Geographical distribution.—Caffraria, South Africa.

Description.—"Top and sides of the head, chin, throat, and upper breast black, with a faint purplish gloss; ear-coverts tipped with pale brown; occiput, hind neck, interscapular region, smaller upper wing-coverts, and tail-coverts bright vinaceous cinnamon; outer and inner webs of all the quills brown, faintly margined and tipped with brownish grey; tail dark brown, central pair and outer webs of lateral rectrices paler brown; lower parts bright vinaceous cinnamon, spotted with brown on the breast and whitish along the middle of the abdomen. The bill is of the somewhat acute form of that of *Otocorys bilopha*."¹

This remarkably distinct species was discovered some twelve years ago by Mr. Hartert among the mounted birds of the Senckenberg Museum at Frankfort-on-the-Main, and the single specimen has remained unique. Although not examined in the present connection, it belongs without doubt to *Otocoris*, though in pattern and details of coloration it is very different from any other member of this group. Though apparently most closely allied to *Otocoris penicillata penicillata*, it differs from this as well as from all the other horned larks in the solid black throat, chin and forehead, cinnamonaceous abdomen and lower tail-coverts, together with the brown outer web of the ninth primary.

The only data accompanying the type specimen was a slip of paper fastened to the stand, and bearing the legend "*Alauda?* Caffraria." As Mr. Hartert thinks, the bird probably came from the interior of South Africa, though there must of necessity be some doubt until additional examples shall have been secured from an unquestionable locality.

¹This quotation is taken from Mr. Hartert's article in the *Ibis* for 1892, pp. 522-523. The original description (*Journ. für Orn.*, 1890, p. 103) is as follows: "*Otocoris*, pileo toto, penicillis brevibus, regione ophthalmica et parotica, gutture pectoreque nigris; notaeo, corporis lateribus, subcaudalibus plus minusve pallide rufis; gastræo medio sordide albido; remigibus fumosis, pogonio externo canescente, primæ remigis pogonio externo non albo; cauda fumoso-nigricante, colore albo nullo."

"Diese prachtvolle neue Ohrenlerche, die in ihrer Schnabel-gestalt mit *Otocoris bilopha* (Temm.) übereinstimmt, in ihrer Grösse der *O. alpestris* nahekommt, in der Färbung mit keiner der bekannten Arten Aenlichkeit hat, erlaube ich mir zu Ehren meines hochverehrten Freundes, Frhr. H. von Berlepsch * * * zu benennen."

Table of measurements.

MALES.

[Measurements in millimeters.]

No. of specimens.	Name of species.	Wing.			Tail.			Exposed culmen.			Tarsus.			Middle toe.		
		Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.
15	<i>alpestris</i>	111.5	113	108	71.8	75	66.5	12.2	13	11	24	25	22	13.5	14	13
7	<i>flava</i>	107.9	111	105.5	70.6	73.5	68.5	10.1	11	9	21.9	23	21	11.9	12.5	11.5
15	<i>hoyti</i>	111.1	115.5	104	70.5	75	65.5	11.4	13	10.5	22.3	23.5	21	12.5	13	11.5
15	<i>arctica</i>	111.5	114.5	108.5	70.7	74	67.5	11.3	12.5	10	22.7	24	21.5	12.6	13	12
15	<i>enthymia</i>	104.8	107.5	101	70.4	75	67	11.3	12.5	10.5	21.8	23	21	12.1	13	11.5
15	<i>leucodæma</i>	105.8	110	101	71.5	77	68	11.5	13	10	21.8	23	20.5	11.7	12	11
15	<i>pratensis</i>	104.2	108	100	69.5	73	67	11.2	12	10	21.6	22.5	20.5	11.7	12	11
7	<i>tiaphora</i>	99.4	103	96.5	67.5	70.5	64.5	11.3	12	11	21.7	22.5	21	11.4	12	11
15	<i>gairaudi</i>	96.8	102	92	62.2	66	56.5	10.5	11	9.5	21.8	22.5	20.5	11.1	12	10.5
15	<i>merrilli</i>	102.9	106	98.5	69	72	64	11	12.5	10	21.6	22.5	20.5	11.5	12	11
14	<i>strigata</i>	98	101	96	65.8	68.5	61.5	11.3	12.5	10	20.8	22	19.5	11.4	12.5	10.5
15	<i>insularis</i>	97.1	101	95	64.4	68	60	11.3	13	10	22	23	21	11.9	13	11
1	<i>peragrina</i>	92			63			10.5			21.5			11.5		
15	<i>chrysolaema</i>	102.9	106.5	98.5	68.8	71.5	64	10.9	12	10	21.4	23.5	20	11.2	12	10.5
15	<i>actia</i>	99.1	102.5	94	65.9	70	62	11	12.5	10	20.8	21.5	20	11.5	12	10.5
15	<i>amnophila</i>	100.2	103.5	96	67.7	72	65	11.4	12.5	10	21.1	22.5	19	11.4	12.5	10
15	<i>rubra</i>	99.6	105	94.5	67.2	71	64.5	11	12	10	21.7	23.5	20	11.8	13	10.5
10	<i>oaxacæ</i>	96.8	99	94.5	61.3	66	58	11.5	12	11	21.9	23.5	21	11.9	13	10.5
15	<i>occidentalis</i>	106.4	110.5	103.5	71.4	75	67	11.2	13	10	21.8	23	20	11.6	12.5	10.5
15	<i>acusula</i>	102.4	105.5	97	68.8	73	65	10.8	12	10	21.2	22	20.5	11.3	12	10
15	<i>aphrasta</i>	102	104.5	99	68.5	72	64	11.2	12	10.5	21.3	22.5	20.5	11.1	12	10
1	<i>paltila</i>	102			69.5			11			20			10		
6	<i>leucansipila</i>	102.9	107	100	67.9	70	65	11.2	12	10.5	21.3	22	21	11.1	11.5	10.5
1	<i>altas</i>	111.2						1.15			20					

¹ Total culmen.

Table of measurements—Continued.

MALES—Continued.

No. of specimens.	Name of species.	Wing.			Tail.			Exposed culmen.			Tarsus.			Middle toe.		
		Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.	Aver- age.	Maxi- mum.	Mini- mum.
2	<i>longirostris</i>	130.8	134	127.5	94	95	93	15	16	14	23.5	24	23	13.5	13.5	13.5
2	<i>elucsi</i>	117	117.5	116.5	80.5	81	80	10.3	10.5	10	23	23.5	22.5	11.5	11.5	11.5
3	<i>perissa</i>	123.5	125	120.5	88.3	90	87	13.3	14	12.5	22.8	23.5	21.5	11.8	13	11
1	<i>argala</i>	124			85			12			23			12		
2	<i>sibirica</i>	109.5	111	108	75.5	76	75	11	11	11	21.8	22.5	21	12.3	12.5	12
1	<i>bitopha</i>	96.3			60			13.8			20					
2	<i>penicillata</i>	117.3	118.5	116	81	82	80	12	13	11	22.8	23	22.5	13	13.5	12.5
	<i>baleanica</i>															
2	<i>oreodroma</i>	116.5	118	115	85.3	87.5	83	10.5	11	10	22.3	23.5	21	12.3	12.5	12
1	<i>diuta</i>	120			82			11.5			22			12		
3	<i>bicornis</i>	111.5	112.5	110	70.7	72.5	67.5	14.5	15	14	21.4	23	20	12.5	12.5	12.5
1	<i>berlepschi</i>	106			70			12			22					

FEMALES.

15	<i>alpestris</i>	103.8	109	101	63.1	66.5	60.5	11.1	12	10.5	23.2	24	22	12.8	14	11.5
6	<i>flava</i>	102.7	104.5	101.5	65.1	67	63.5	9.3	9.5	9	21.6	23	21	12.3	13	11.5
13	<i>hoyti</i>	104	107	102	63.2	69	60	10.8	11.5	10	22.1	23	21	12	13	11
6	<i>articola</i>	104.1	106	101.5	64.3	67	62	10.2	9.5	11	22.3	23	21.5	12.3	13	11.5
15	<i>enthymia</i>	97.6	101	93.5	62.2	66	59	10.2	11	9	21.2	22	20	11.5	12	10.5
15	<i>leucotema</i>	98.6	102	95	64	67	58	10.5	11.5	9.5	21.1	22	20	11.4	12	10.5
15	<i>praticola</i>	96.8	100.5	95	61.7	66	59	10.8	11.5	10	21.5	23	20	11.7	12.5	11
1	<i>diaphora</i>	89			56			11.5			20.5			10.5		
15	<i>girardi</i>	90.2	93.5	87	55.9	59	52.5	10.3	11	10	21.4	22.5	20.5	10.8	12	10
15	<i>merrilli</i>	97.1	102	94	62.8	66	58.5	10.6	12	9.5	21.2	21.5	19	11.3	12	10
10	<i>strigata</i>	92	93.5	90	53.6	63.5	56.5	10.2	11	9	20.4	21.5	19	11.7	12.5	11
15	<i>insularis</i>	91.4	97	88	53.8	63	55	11.4	12.5	10	21.3	22.5	20	11.7	12.5	11

1	<i>peregrina</i>	92	96.5	91	63	58	10.5	11	9.5	21.5	22	20	11.1	11.5	10
15	<i>chrysotama</i>	94.8	96	87	58.8	54.5	10.6	8.5	12	20.2	21.5	17.5	10.8	12	9.5
15	<i>actia</i>	93	96	90	59.5	57.5	10.3	11.5	9.5	20.6	22	19.5	11.1	11.5	10.5
10	<i>ammophila</i>	92.6	96	89	59.5	55	10.1	11.5	9.5	20.8	22	20	11.3	12	10.5
12	<i>rubra</i>	92.4	95.5	87	55.5	53	10.6	11	10	21	22	20	11.4	12	11
4	<i>oazae</i>	89.3	90.5	87	63.8	62	10.3	12	9.5	21	22	19	11.3	12	10
15	<i>occidentalis</i>	98.8	103	95	66	65.5	10.4	11	9.5	20.5	21	19.5	10.8	11.5	10
15	<i>adusta</i>	96	98.5	91.5	61.4	58	10.8	12	9.5	20.5	22	18.5	10.7	11.5	9.5
10	<i>aphrasta</i>	95.1	99	91.5	61	65.5	10.8	12	9.5	20.5	22	18.5	10.7	11.5	9.5
	<i>pallida</i>														
2	<i>teucansipila</i>	94.5	96	93	59	58.5	11.3	11.5	11	21.8	21.5	21	11	11	11
1	<i>altas</i>	102.5					112.5			17.5					
	<i>longirostris</i>														
1	<i>elwesii</i>	107			78		11			20.5			11		
1	<i>perissa</i>	115.5			79		14			23.5			13.5		
	<i>argalea</i>														
1	<i>sibirica</i>														
1	<i>bilopha</i>	99			66.5		10			20			10		
	<i>penicillata</i>														
	<i>baltanica</i>														
1	<i>oreodrama</i>	112.5			80		10.5			22			12.5		
2	<i>ditula</i>	110.5	112	109	78.5	71	10.5	11	10	22	22	22	12.5	13	12
2	<i>bicornis</i>	103.8	105.5	102	68.8	68	12.8	13	12.5	23	23	23	13	13	13
	<i>berlepschi</i>														

1 Total culmen.



1.



2.

HOMES OF (1) *OTOCORIS ALPESTRIS PRATICOLA*, WOOSTER, OHIO;
AND (2) *O. A. LEUCOLÆMA*, STAKED PLAINS, NEAR DIMMITT,
TEXAS.



1.



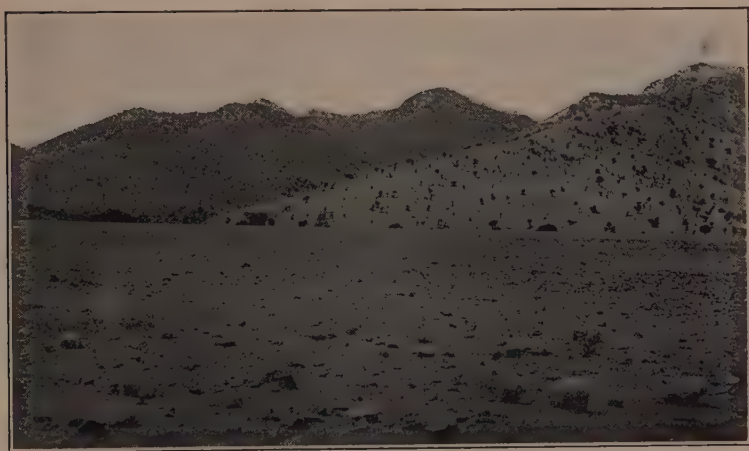
2

HOMES OF *OTOCORIS ALPESTRIS LEUCOLÆMA*.

1. Near Stillwater, Nevada. 2. Toyabe Mountains, Nevada.



1.



2.

HOMES OF (1) *OTOCORIS ALPESTRIS GIRAUDI*, SHORE OF MATAGORDA BAY,
TEXAS; AND (2) *O. A. ADUSTA*, HUACHUCA MOUNTAINS, ARIZONA.

DESCRIPTIONS OF NEW DECAPOD CRUSTACEANS FROM THE WEST COAST OF NORTH AMERICA.

By MARY J. RATHBUN,

Second Assistant Curator, Division of Marine Invertebrates.

The species and subspecies here described are the result chiefly of a study of the vast collection of shrimps from the coast of Alaska southward to San Diego, California, which have been accumulating for many years in the United States National Museum, and have been obtained largely by the United States Fish Commission steamer *Albatross*. Besides the shrimps, one new crab, an *Oregonia*, was dredged by the *Albatross* during her cruise in Bering Sea in 1900.

In connection with the publication of the Decapod Crustacea of the Harriman Expedition, it is proposed to give a list of the forms known to inhabit the coast of western America (north of Mexico) and to more fully describe and figure the new and little-known species.

Family MAIDÆ.

OREGONIA BIFURCA.

Surface tuberculate and hairy. Postorbital width two-thirds of branchial width. Rostral horns divergent from their base. Basal joint of antenna armed on its outer edge with a stout blunt subterminal spine and three small spines, one of which is at the anterior angle. Inner surface of merus of chelipeds bordered by short blunt spines; propodus slightly longer than merus, fingers and palm subequal, margins of palm subparallel. Dactyli of ambulatory legs contained about one and a third times in their propodi.

Dimensions.—Length of carapace and rostrum 26.5 mm., width of carapace 19.6 mm., width between tips of postorbital spines 13 mm., length of horn measured along the inner edge 3.4 mm., distance between tips of horns 3.5 mm.

Type locality.—One specimen only, a female, was taken by the U. S. Fish Commission steamer *Albatross* at station 3785, north of Rat Islands, Aleutians, 270 fathoms (Cat. No. 25287).

Family CALLIANASSIDÆ.

CALLIANASSA GONIOPHTHALMA.

Closely allied to *C. cæcigena* Alcock and Anderson. Rostrum reaching barely one-third the length of the eyes. No median carina, but a slight blunt elevation near the posterior margin corresponding to the strong tooth in *C. cæcigena*. Eyes oblong, sides subparallel, reaching nearly to end of first antennular segment. Chelipeds of the first pair shaped as in *C. cæcigena*, but the carpus of the larger one is devoid of a spine, the palm is not serrated on its lower margin, its outer surface has a few tubercles irregularly disposed on the distal lower quarter; the pollex has on the cutting edge a stout tooth which is nearer the middle than in *C. cæcigena*. The second to fifth segments, inclusive, of the abdomen are without spines, the telson has subparallel side margins.

Dimensions.—Length of carapace of male 30.5 mm., of abdomen 67.5 mm.

Type locality.—Off Point Conception, California, 278 fathoms, station 3198, U. S. Fish Commission steamer *Albatross*, one male (Cat. No. 25238).

Distribution.—Also dredged in 322 fathoms in Clarence Strait, Alaska, station 3077.

Family AXIIDÆ.

AXIUS SPINULICAUDA.

Gastric region traversed by five carinæ, all of which fade out before reaching the cervical groove; the median extends along basal third of rostrum and is armed with four spines; the outer carinæ are a continuation of the side margins of the rostrum, and are unarmed, as are also the shorter intermediate carinæ. Surface covered with rather distant scabrous granules. Rostrum reaches middle of second joint of antennular peduncle, is sharp-pointed, and has five spines on one side and six on the other. Second segment of antennular peduncle a little longer than the third, both together shorter than the first. The scaphocerite projects as far as the middle of the second segment of the antennula, the stylocerite to end of penult joint of antennal peduncle. First pair of chelipeds missing. Abdomen smooth above; pleura sculptured and pubescent; telson elongate, subquadrilateral, lateral margins spinulose, dorsal surface with a few spines; swimmerets spinulose.

Dimensions.—Female, length of carapace and rostrum 19.6 mm., rostrum 3.5 mm., abdomen 31.5 mm.

Type locality.—One specimen only, from off Bodega Head, California, 62 fathoms, station 3172, U. S. Fish Commission steamer *Albatross* (Cat. No. 25239).

CALASTACUS QUINQUESERIATUS.

Allied to *C. felix* Alcock and Anderson.

Carapace and rostrum as long as first five abdominal somites; surface pitted and setose. Rostrum reaches end of second antennular segment, is tipped with a spine, side margins armed with three to seven spines, and prolonged two-thirds the length of gastric region, where they bear five or six spines; these prolongations form a horseshoe. Median carina with from two to six spines. Intermediate carina with from three to five spines. Eyes colorless, globular. Stylocerite reaching to distal third of penult joint of peduncle; scaphocerite not reaching middle of stylocerite. Chelipeds unequal, the longer one in the male nearly as long as the body. Outer surface of carpus and hand covered with sharp granules or short spines; upper margin spinous, also lower inner margin of merus; lower outer margin of merus spinous; lower margin of propodus granulous. Margins of propodus subparallel, fingers shorter than palm in adult males, usually slightly gaping at base.

Abdomen almost smooth, sides setose. Anterior margin of pleura of third, fourth, and fifth somites, and lower margin of sixth, armed with a small spine. Telson subquadrangular, broadly rounded behind, having a few lateral and one median marginal spine, and two larger dorsal spines.

Dimensions.—Male, length of carapace and rostrum 28 mm., of abdomen 41 mm.

Type locality.—San Luis Obispo Bay, California, 200 fathoms, station 3196, U. S. Fish Commission steamer *Albatross* (Cat. No. 25240).

Distribution.—Also taken at six other stations on the coast of southern California, in 160 to 388 fathoms.

Family PENÆIDÆ.

GENNADAS BOREALIS.

Allied to *G. parvus* Bate. Rostrum longer, reaching at least half way along the eyestalk, sometimes to the cornea; armed with one tooth. Median carina very distinct nearly to posterior border of carapace. A sharp marginal spine at angle of antero-lateral sinus. The antennal scale projects beyond the antennular peduncle by about the length of the last segment of the peduncle. Chelæ of first pair of feet narrow and elongate as in the succeeding pairs. Sixth abdominal somite more than twice as long as fifth, carinate. A small lateral spine at the posterior fourth of the telson. The thelycum differs from that of *G. parvus* in having the transverse plate between the feet of the fourth pair subquadrilateral, narrow in front, and that between the fifth pair fan-shaped, narrow behind, anteriorly rounded, and with

a blunt median point. The leaves of the andricum are small and not in contact.

Dimensions.—Male, length of carapace and rostrum, 13.6 mm.; of abdomen, 29 mm.

Type locality.—Off Copper Island, Kamchatka, 1,567 fathoms, station 3783, U. S. Fish Commission steamer *Albatross* (Cat. No. 25241).

Distribution.—Also taken in Bering Sea, north of Rat Islands, Aleutians, 850 fathoms, station 3784.

Family CRANGONIDÆ.

Genus CRANGON.

a. Group of *C. nigricauda*, in which the carapace has only one median spine, and the gastric region is not depressed below the general level.

CRANGON ALASKENSIS ELONGATA.

Dr. S. J. Holmes, in his very useful Synopsis of California Stalk-Eyed Crustacea,¹ has given the synonymy and diagnoses of seven species of *Crangon* known to occur on the west coast of the United States. I would exclude *Crangon alaskensis* Lockington from the synonymy of *C. nigricauda* Stimpson, and raise it to specific rank, as in a large series of specimens it differs from *C. nigricauda* in the antennal scale being a little longer and much narrower distally, the extremity of the blade not produced at the antero-internal angle, the spine longer; the first pair of trunk feet shorter; hands more slender, their distal margin more oblique. *C. nigricauda* ranges from British Columbia to Lower California, *C. alaskensis* from Bering Sea to Straits of Fuca.

Typical *C. alaskensis* passes by insensible gradations into a form occurring off the coast of California and Oregon in 9 to 53 fathoms, which differs in its longer and narrower rostrum, in the outer antennular flagellum falling considerably short of the antennal scale, in the much longer scale, equal to the length of the carapace exclusive of the rostrum, in the fourth segment of the abdomen showing signs of carination, in the telson flattened above, though scarcely grooved, while its tip is more acute than in typical *C. alaskensis*.

Dimensions.—Length of ovigerous female from tip of rostrum to tip of telson, 55.7 mm.; length of carapace, 13.5 mm.; of antennal scale, 11.6 mm.

Type locality.—Off Santa Barbara, California, 29 fathoms, U. S. Fish Commission steamer *Albatross* stations 2970 and 2971 (Cat. No. 25242).

CRANGON HOLMESI.

Allied to *C. alba* Holmes in not having a groove on the under side of the sixth abdominal somite. Carapace a third as long as abdomen; rostrum short, narrow, triangular, tip rounded. Antennal scale as

¹ Occasional Papers of the California Academy of Sciences, VII, 1900.

long or nearly as long as the carapace, exclusive of rostrum. Maxillipeds exceeding scale, antepenult segment not dilated. Hand elongate, about three times as long as wide.

Dimensions.—Ovigerous female, length, 23 mm.; of carapace, 5.3 mm.; of antennal scale, 4.2 mm.

Type locality.—Off Wilmington, California, 27 fathoms, U. S. Fish Commission steamer *Albatross* station 2939 (Cat. No. 25243).

CRANGON DALLI.

Rostrum long and narrow. Acicle about seven-tenths as long as carapace, obliquely subtruncate, inner angle of extremity rounded, receding, spine extending beyond the blade to no greater extent than anterior width of blade. Hands widening from proximal to distal end, distal margin transversely oblique, length of palm about two and two-thirds its width. Sixth abdominal somite with two blunt prominent carinæ, which are the most distinguishing feature of the species.

Dimensions.—Length of ovigerous female, 61.5 mm.; of carapace, 16.2 mm.; of scale, 11.5 mm.

Type locality.—Bering Sea, off Cape Seniavin, Alaska, 30 fathoms, U. S. Fish Commission steamer *Albatross* station 3287 (Cat. No. 25244).

Distribution.—One of the most abundant of Alaskan shrimps. Ranges from Bering Sea to Washington and to Kurile Islands, in $4\frac{1}{2}$ to 61 fathoms.

CRANGON FRANCISCORUM ANGUSTIMANA.

Differs from typical *C. franciscorum* chiefly in the shape of the hands, which are narrower, the difference being greater in the male than in the female (in the male the length is five and a half times the width), the dactylus is more longitudinally placed, the pollex is more transverse and nearer the proximal end of the hand.

Dimensions.—Length of female 70.6 mm., of carapace 18.9 mm., of scale 13 mm.

Type locality.—Off Chuckanuts Island, Bellingham Bay, Washington, 11 fathoms, station 3612, U. S. Fish Commission steamer *Albatross* (Cat. No. 25245).

Distribution.—Ranges from British Columbia to Oregon, in 23 to 67 fathoms.

b. Group of *C. communis*, in which the carapace has two median spines and the gastric region is not depressed below the general level.

CRANGON RESIMA.

Anterior of median spines much the smaller. Rostrum advanced beyond eyes, ascending, and having, in full-grown individuals, an inferior plate, thin, compressed, spatulate. Second segment of antennular peduncle three times as long as third. Hands shorter than in

C. communis, three times as long as broad; their anterior margin and also the dactylus, when flexed, are more longitudinal than in *C. communis*.

Dimensions.—Length of ovigerous female 48.3 mm., length of carapace 12.2 mm., of scale 8.2 mm.

Type locality.—Off San Diego, California, 124 fathoms, U. S. Fish Commission steamer *Albatross* station 2935 (Cat. No. 25246).

Distribution.—Ranges from Monterey Bay, California, to San Domingo Point, Lower California, 44 to 266 fathoms.

CRANGON ABYSSORUM.

Integument very thin. Anterior of median spines minute. Rostrum linear, flattened above, acute, ascending at an angle of 30 degrees, below compressed. Eyes very large, hemispherical, inner faces flat and contiguous. Second segment of antennulæ about one and a half times as long as third. Maxillipeds exceeding scale by half length of terminal segment. Manus widening distally, length three times width, dactylus more longitudinal than transverse. Sixth abdominal somite having two prominent dorsal carinæ and a short, low, lateral carina.

Dimensions.—Length of female 61 mm., of carapace and rostrum 17 mm., of scale 10.3 mm.

Type locality.—Bering Sea, southwest of Pribilof Islands, 1,771 fathoms, station 3603, U. S. Fish Commission steamer *Albatross* (Cat. No. 25247).

Distribution.—Extends from Bering Sea to southern end of California, in 685 to 1,771 fathoms.

c. *Group of C. munita*, in which the gastric region is depressed below the general level of the carapace.

CRANGON ACCLIVIS.

Compared to *C. munita* Dana, the lower lateral spine of carapace is further back, the anterior median spine is much larger and farther forward, projecting well in front of the posterior line of the orbits; the rostrum is narrower, ascending at an angle of about 45 degrees, and the anterior margin of the hand is more longitudinal.

Dimensions.—Length of male 24.8 mm., length of carapace 7.4 mm., of scale 3 mm.

Type locality.—Off Santa Cruz Island, California, 266 fathoms, station 2948, U. S. Fish Commission steamer *Albatross* (Cat. No. 25248).

Distribution.—Dredged from off the Trinity Islands, Alaska, to southern California, 80 to 266 fathoms; scarce.

CRANGON VARIABILIS.

Like *C. munita*, but carapace nearly half as long as abdomen, rostrum convex from behind forward, tip rounded and thickened. Outer

margin of antennal scale concave. Second to fifth, inclusive, and sometimes the first, somites of abdomen carinated, and except on the first and second the carina is usually high, laterally compressed, and blunt.

Dimensions.—Female, length of body 32.2 mm, of carapace 9.2 mm.

Type locality.—Off North Head, Akutan Island, Alaska, 72 fathoms, station 2842, U. S. Fish Commission steamer *Albatross* (Cat. No. 25249).

Distribution.—Ranges from Bering Sea to southern California, 72 to 184 fathoms.

CRANGON SPINOSISSIMA.

Compared to *C. variabilis*, the lower lateral spine of the carapace is more nearly in line with the superior lateral spine; the anterior median spine is larger and farther forward, advancing to a line in front of the posterior line of the orbits; rostrum narrower, longer, acute, and more ascending; hand longer and narrower. Differs from all allied species in having the somites of the abdomen armed laterally with spines.

Dimensions.—Female, length of body 36 mm., of carapace 10.5 mm.

Type locality.—Off Point Arena, California, 51 fathoms, station 3351, U. S. Fish Commission steamer *Albatross* (Cat. No. 25250).

Distribution.—Off Oregon and California, 51 to 96 fathoms.

CRANGON SPINIROSTRIS.

Differs from all others of the *munita* group in having a long sub-erect spiniform rostrum. Anterior median gastric spine similar to the rostrum. Orbital spine slender and ascending, antero-lateral spine directed upward and outward. Third, fourth, and fifth abdominal somites carinated.

Dimensions.—Female, length of body 35.4 mm., of carapace 10.5 mm.

Type locality.—North of Unalaska, 399 fathoms, station 3329, U. S. Fish Commission steamer *Albatross* (Cat. No. 25251).

SCLEROCRANGON ALATA.

A small species allied to *S. boreas*. Carapace only slightly broader than long, surface sculptured and pitted, two spines and a tubercle on median carina. Antero-lateral angles broadly alate. Spine of antennal scale advanced as far as or farther than the blade. Hand less than twice as long as broad. Abdominal pleura without spines.

Dimensions.—Male, length 38 mm., length of carapace 11 mm., width at branchial spine 10.7 mm.

Type locality.—Admiralty Inlet, Puget Sound, 40 fathoms, station 2865, U. S. Fish Commission steamer *Albatross* (Cat. No. 25252).

Distribution.—From Bering Sea to Puget Sound, 6 to 91 fathoms.

NECTOCRANGON DENTATA.

Differs from *N. lar* (Owen), with which it has been confused, in the carinæ of the sixth abdominal somite ending in a small sharp tooth or spine, and the more elongate hand, which is about five or more than five times as long as its width across the palm.

Dimensions.—Female, length of body 73 mm., of carapace 19 mm., of hand 10 mm., width of palm 2.1 mm.

Type locality.—Off Sitkalidak Island, Alaska, 69 fathoms, station 2855, U. S. Fish Commission steamer *Albatross* (Cat. No. 25253).

Distribution.—From Bering Sea eastward to Sitka and westward to Kamchatka, 6 to 96 fathoms.

NECTOCRANGON OVIFER.

A deep-water species, also closely related to *N. lar*. Median crest of carapace higher, spines more ascending, anterior marginal spines above the eyes longer and more deeply separated, eyes larger, abdomen shorter, median carina higher, carinæ of sixth somite terminating in a small spine or tooth. Eggs larger than in *N. lar* or *N. dentata*.

Dimensions.—Female with eggs, length 60 mm., length of carapace 17.4 mm.

Type locality.—Off the Trinity Islands, Alaska, 159 fathoms, station 2853, U. S. Fish Commission steamer *Albatross* (Cat. No. 25254).

Distribution.—Found in Bering Sea and along the Alaska Peninsula, 56 to 368 fathoms.

NECTOCRANGON CALIFORNIENSIS.

Allied to *N. ovifer*. Eyes smaller, spine of antennal scale projecting not so far beyond the blade, hands having the digital spine situated nearer the wrist, and the distal margin in consequence more longitudinal; above all, the first and second abdominal somites are noncarinate, and the carina of the third and fourth somites is rather feebly developed.

Dimensions.—Male, length of body 31 mm., of carapace 8.6 mm.

Type locality.—Off Santa Catalina Island, California, 80 fathoms, station 3664, U. S. Fish Commission steamer *Albatross* (Cat. No. 25255).

NECTOCRANGON LEVIOR.

Allied to *N. crassa* Rathbun, but has the first four abdominal somites noncarinate, except for a tubercle on the first, and the carinæ of the fifth and sixth somites less clearly marked than in that species. The pleura of all the somites have shallow depressions.

Dimensions.—Female, length 47.7 mm., length of carapace 13.1 mm.

Type locality.—Admiralty Inlet, Puget Sound, 40 fathoms; station 2865, U. S. Fish Commission steamer *Albatross* (Cat. No. 25256).

Distribution.—Occurs sparingly from Aleutian Islands to Puget Sound, in 10 to 68 fathoms.

Family HIPPOLYTIDÆ.

Genus SPIRONTOCARIS.

a. *Species having one or more supraorbital spines.*

SPIRONTOCARIS ARCUATA.

Very closely allied to, and in part associated with, *S. spina* (Sowerby). In the adult female, the upper line of carapace and rostrum in profile forms a single curve, without the sinus shown in *S. spina*; posterior lobe of third abdominal somite shorter and broader than in that species, sixth segment considerably shorter, less than one and a half times as long as wide; dactyli of third to fifth pairs of feet shorter than in *S. spina*, that of last pair being contained at least three times in propodus.

Dimensions.—Female, length 53.8 mm., length of carapace and rostrum 20 mm., of rostrum 8 mm.

Type locality.—Washington Sound, Straits of Fuca, 48 fathoms; station 2864, U. S. Fish Commission steamer *Albatross* (Cat. No. 25257).

Distribution.—From Bering Sea to Straits of Fuca, in 3 to 350 fathoms.

SPIRONTOCARIS MURDOCHI.

Hippolyte spinus MURDOCH, Report Internat. Polar Exped. to Point Barrow, Alaska, 1885, p. 140 (not *Cancer spinus* Sowerby).

Allied to *S. spina* (Sowerby) and *S. liljeborgii* (Danielssen). Description of female: Rostrum three-fourths as long as remainder of carapace, not reaching tip of antennal scale; midrib nearly horizontal; upper limb convex, 20 to 22 small irregular teeth; lower limb deeper, convex, 1 to 4 small teeth near end. Eyes as wide as the antennular peduncle and half its scale. Spine of antennal scale advanced about as far as blade. Dactyli of last three pairs of feet long and slender, that of last pair half as long as propodus. Abdomen not carinate; sixth segment three-fourths as broad as long.

Dimensions.—Female, length 46.6 mm., length of carapace and rostrum 17 mm., of rostrum 7.5 mm.

Type locality.—Off Robben Island, east coast of Saghalin, Okhotsk Sea, station 3650, U. S. Fish Commission steamer *Albatross* (Cat. No. 25258).

Distribution.—Also taken on the east coast of Kamchatka and Arctic coast of Alaska.

SPIRONTOCARIS TRUNCATA.

Allied to *S. spina*. Carapace armed with 4 median spines; rostrum subtriangular, widest at the extremity, about three-fifths as long as carapace, midrib curving upward, upper margin with 1 spine at its middle, extremity with 7 spines, 2 above and 4 below the midrib. Supraorbital spines 2, equal, large, 1 behind, not above the other, distant.

Dimensions.—Length of male 14 mm.

Type locality.—Heceta Bank, Oregon, 50 fathoms, station 2886, U. S. Fish Commission steamer *Albatross* (Cat. No. 25259).

SPIRONTOCARIS SNYDERI.

Near *S. bispinosa* Holmes. Median spines of carapace 3 or 4, separated from the rostral teeth, which are 5 or 6 on the upper margin and 3 or 4 on the lower. Rostrum shorter than carapace, much the shape of that of *S. bispinosa*, excepting that the midrib is more rapidly ascending and ends in a short point, the upper lamina is shallower and of rather even depth. Antennal peduncle reaches only about one-third length of scale. Dactyli of third, fourth, and fifth pairs of feet a third or less than a third as long as their propodi.

Dimensions.—Ovigerous female, approximate length, 28 mm.; length of carapace and rostrum, 9.4 mm.; of rostrum, 4.4 mm.

Type locality.—Monterey Bay, California, J. O. Snyder, collector (Cat. No. 25260).

Distribution.—From Puget Sound to Lower California.

SPIRONTOCARIS SICA.

Near *S. bispinosa* Holmes. The posterior tooth of the carapace is considerably in front of the middle. Rostrum shorter than in *S. bispinosa*, both upper and lower laminae narrower and extending nearer the tip. Second segment of antennular peduncle three times as long as third segment. Outer maxillipeds reach beyond antennal scale. Thoracic feet longer and slenderer than in *S. bispinosa*, the first pair overreaching the antennular peduncle. The maxilliped and the first foot only are provided with an epipod.

Dimensions.—Female, length 58 mm., length of carapace and rostrum 24.8 mm., of rostrum 12.8 mm.

Type locality.—Santa Barbara Channel, 265 fathoms, station 3200, U. S. Fish Commission steamer *Albatross* (Cat. No. 25261).

Distribution.—Found only on the coast of California, 211 to 464 fathoms.

SPIRONTOCARIS DALLI.

Allied to *S. ochotensis* (Brandt). Rostrum longer, reaching nearly to end of antennal scale, midrib straighter, less sinuous, terminating

in a single sharp spine; teeth 6 to 8 above; 3 to 4 below. Last three pairs of thoracic feet longer and more slender than in *S. ochotensis*; sixth abdominal segment longer, being more than one and a half times as long as the fifth segment.

Dimensions.—Female, approximate length 38 mm., length of carapace and rostrum 13.6 mm., of rostrum 6 mm.

Type locality.—Coal Harbor, Unga Island, Alaska, 8 to 9 fathoms, W. H. Dall, collector (Cat. No. 25262).

Distribution.—Alaska, 6 to 20 fathoms.

SPIRONTOCARIS UNALASKENSIS.

Agrees with *S. polaris* (Sabine) and differs from all other species which possess a supraorbital spine, in the maxilliped being without an exognath, while it and the first two pairs of feet are provided with an epipod. Female: Posterior median spine of carapace situated at the anterior third (rostrum excluded). Rostrum longer than acicle, dorsal spines 4 or 5, 2 on carapace and 2 or 3 at base of rostrum; no upper limb on distal portion, lower limb shallow, convex, 3-spined in front of middle. Eyes large, pyriform. Third segment of antennules less than half as long as second. Antennal peduncle extending nearly to end of second segment of antennular peduncle. Hinder portion of third abdominal segment very prominent; sixth segment about one and two-thirds times as long as fifth.

Dimensions.—Female, length 60 mm., carapace and rostrum 26.5 mm., rostrum 14.5 mm.

Type locality.—North of Unalaska, 350 fathoms, station 3331, U. S. Fish Commission steamer *Albatross* (Cat. No. 25263).

SPIRONTOCARIS VICINA.

Allied to the preceding; second foot without an epipod.

Female.—Dorsal spines 7 or 8 (2 on carapace), the anterior not very near tip of rostrum; inferior spines 4. Second segment of antennular peduncle about three times as long as third; basal scale falls considerably short of second joint of peduncle. Antennal peduncle does not reach middle of second segment of antennular peduncle.

Dimensions.—A female with rostrum and telson incomplete measures 39 mm. from the orbit to the end of the sixth abdominal somite.

Type locality.—North of Unalaska, 309 fathoms, station 3316, U. S. Fish Commission steamer *Albatross* (Cat. No. 25264).

SPIRONTOCARIS WASHINGTONIANA.

Female.—Posterior median spine at anterior fourth of carapace (rostrum excluded). Rostrum slender, half as long as carapace, nearly horizontal, slightly sinuous, dorsal spines 4 (2 on carapace), 3 teeth below on anterior third. Second segment of antennular peduncle

three times as long as third; basal scale two-thirds as long as first segment. Acicle two-thirds as long as carapace, oblong-lanceolate; peduncle reaching middle of acicle. Outer maxilliped extends beyond antennal scale by half the length of its last segment; without exopod, but with an epipod; first three pairs of feet with epipods.

Dimensions.—Female, length 39 mm., of carapace and rostrum 14 mm., of rostrum 5 mm.

Type locality.—Off Sea Lion Rock, Washington, 685 fathoms, station 3071, U. S. Fish Commission steamer *Albatross* (Cat. No. 25265).

b. *Species having no supraorbital spine.*

SPIRONTOCARIS FLEXA.

Very near *S. gracilis* (Stimpson); differs chiefly in longer basal scale of antennula, reaching a little beyond first segment, in lower position of pterygostomian spine, in the presence of epipods on the maxilliped and first two pairs of feet.

Dimensions.—Female, length 54 mm., of carapace and rostrum 20 mm., of rostrum 11.5 mm.

Type locality.—North of Bird Island, Shumagins, Alaska, 21 fathoms, station 2850, U. S. Fish Commission steamer *Albatross* (Cat. No. 25266).

Distribution.—From Bering Sea to Drakes Bay, California, 10 to 93 fathoms.

SPIRONTOCARIS DECORA.

Rostrum longer than carapace, 4 to 5 superior teeth (1 to 2 on carapace), anterior tooth in front of middle of rostrum; rostrum less slender than in *S. gracilis* or *S. flexa*, a little concave above, nearly horizontal; 6 to 8 teeth below. Maxilliped without exognath, but with an epipod; no epipods on feet. Posterior margin of third abdominal segment strongly produced at the middle, but the segment is not laterally pinched or carinated; sixth segment longer than seventh.

Dimensions.—Female, approximate length 47 mm., length of carapace and rostrum 16.4 mm., of rostrum 9 mm.

Type locality.—Off Santa Cruz Island, California, 150 fathoms, station 2946, U. S. Fish Commission steamer *Albatross* (Cat. No. 25267).

Distribution.—From Straits of Fuca to San Diego, California, 50 to 171 fathoms.

SPIRONTOCARIS TRIDENS.

Allied to *S. gracilis*, *S. flexa*, and *S. decora*, but stouter. Superior teeth 3, 1 on carapace and 2 at base of rostrum; inferior 3 to 6. Basal scale of antennules with a spine which extends nearly to end of second segment. Acicle, measured along its outer margin, a little shorter than carapace. Third abdominal somite well produced backward and

its posterior portion carinated, the carina defined on either side by a deep groove like the imprint of a nail.

Dimensions.—Female, approximate length 61 mm.; length of carapace and rostrum 22 mm., of rostrum 12.5 mm.

Type locality.—Admiralty Inlet, Puget Sound, 40 fathoms, station 2865, U. S. Fish Commission steamer *Albatross* (Cat. No. 25268).

Distribution.—From Aleutian Islands to Washington, to a depth of 48 fathoms.

SPIRONTOCARIS TOWNSENDI.

Closely allied to *S. gaimardii*, and may be compared with *S. gaimardii belcheri* (Bell), which is the only form of *S. gaimardii* known to occur on the Pacific coast, and which ranges from the Arctic shores of Alaska and Siberia southward to Sitka.

In the female of *S. townsendi*, the rostrum reaches almost or quite to the end of the acicle and is armed above with 5 to 7 spines (2 on carapace), below with 3 to 6 spines; lower limb deeper than in *S. gaimardii belcheri*; rostrum nearly straight. Pterygostomial spine very small. Scale at base of antennula reaches end or nearly to end of second segment; second segment scarcely longer than third. Antennal scale almost as long as carapace. The maxillipeds reach to distal fourth of antennal scale; the fifth pair of feet do not attain end of maxilliped.

Third abdominal segment smoothly rounded, without lobe or angle in a profile view; posterior margin produced moderately backward at the middle. Fourth segment devoid of a lateral spine; telson provided with 3 or 4 lateral spinules on each side.

Dimensions.—Female, approximate length 60.5 mm.; length of carapace and rostrum 20 mm., of rostrum 10.6 mm.

Type locality.—Washington Sound, Straits of Fuca, 48 fathoms, station 2864, U. S. Fish Commission steamer *Albatross* (Cat. No. 25269).

Distribution.—From Bering Sea to Puget Sound, 21 to 114 fathoms.

SPIRONTOCARIS MOSERI.

Of the *gaimardii* group, but the maxilliped is without exognath, and the maxilliped and the first foot only are provided with an epipod. Rostrum about as long as or longer than carapace; teeth 6 to 8 above (2 on carapace), 4 to 7 below. Antennal spine strong; pterygostomial small. Eyes large, pyriform. The antennular peduncle reaches to the middle or the distal third of antennal scale; second segment a little longer than third; spine of basal scale reaches to middle of second segment. Antennal peduncle very stout and nearly as long as antennular; scale narrow-ovate, its outer margin about five-sevenths as long as carapace. The maxillipeds exceed the scale by one-fourth or more of the length of the last segment. The first pair of feet overreach the

antennular peduncle, the second pair reach tip of maxillipeds, the fifth pair extend to or beyond end of antennal scale. Dactyli of third, fourth, and fifth pairs short, very stout, and armed with strong spines. Upper margin of third abdominal segment in profile smoothly rounded; posteriorly the segment is strongly produced over the fourth, which has a spine on either side; sixth twice as long as fifth; seventh longer than sixth; 4 or 5 lateral spines.

Dimensions.—Female, length 57 mm.; length of carapace and rostrum 22.7 mm., of rostrum 11.5 mm.

Type locality.—Off Segouam, Aleutians, 283 fathoms, station 3480, U. S. Fish Commission steamer *Albatross* (Cat. No. 25270).

Distribution.—Bering Sea, southward and eastward to Washington, 60 to 516 fathoms.

SPIRONTOCARIS MAXILLIPES.

Very near *S. moseri*, but distinguished as follows: Rostrum shorter, about four-fifths as long as carapace, teeth 5 to 8 above, 2 to 6 below. The antennular peduncle reaches two-thirds or more of the length of the antennal scale; second segment a little longer than in *S. moseri*; spine of basal scale scarcely reaches middle of second segment, or may not extend beyond first. The antennal peduncle does not reach beyond second segment of the antennular; scale about two-thirds length of carapace. More than one-half of the last segment of outer maxilliped extends beyond scale. No epipods on feet. Minute spinule on fourth abdominal somite; sixth somite one and a half times fifth; spinules of telson commonly three on each side.

Dimensions.—Female, length 48.9 mm.; length of carapace and rostrum 18.4 mm., of rostrum 8.6 mm.

Type locality.—Off Segouam, Aleutians, 283 fathoms, station 3480, U. S. Fish Commission steamer *Albatross* (Cat. No. 25271).

Distribution.—Also taken at stations 3330, 3331, and 3338; depth, 350 to 625 fathoms.

SPIRONTOCARIS BRACHYDACTYLA.

Closely allied to the three immediately preceding, but distinguished from them by the short fingers of the first chelipeds, which are not more than a third as long as the palm. Rostrum distinctly shorter than carapace, 6 teeth above (1 on carapace), 3 below. No pterygostomian spine. Like *S. maxillipes*, the feet are devoid of epipods.

Dimensions.—Length of ovigerous female, exclusive of rostrum and telson, 24.8 mm.; length of carapace (rostrum excluded) 7.7 mm.

Distribution.—Southern California, 266 to 417 fathoms; type locality, off Santa Cruz Island, 266 fathoms, station 2948, U. S. Fish Commission steamer *Albatross* (Cat. No. 25272).

SPIRONTOCARIS KINCAIDI.

Near *S. camtschatica* (Stimpson). Rostrum one-third longer than carapace, horizontal, slightly concave above, 5 teeth above (2 on carapace), 5 teeth below. Antennular peduncle reaching about two-fifths length of antennal scale, second and third segments very short and subequal, basal scale reaching end of second segment. Antennal peduncle almost as long as antennular, scale tapering, exceeding the carapace. No exognath, but an epignath on maxilliped. No epipods on feet. Abdomen strongly bent at third somite, which is produced backward in a strong lobe; fourth somite spineless.

Dimensions.—Ovigerous female, approximate length 36.5 mm.; length of carapace and rostrum 13.6 mm., of rostrum 7.7 mm.

Type locality.—Off Santa Cruz, California, 21 fathoms, station 3124, U. S. Fish Commission steamer *Albatross* (Cat. No. 25273).

Distribution.—Also taken on coast of Washington in 37 to 40 fathoms.

SPIRONTOCARIS BIUNGUIS.

Also of the *gaimardii* type, but easily distinguished by the very large, pyriform eyes, the cornea covering the greater part of the peduncle, by the longer rostrum, which is from one and a fourth to one and two-thirds times as long as the remainder of the carapace, by the maxilliped possessing an exopod and an epipod, while the feet are destitute of epipods, and by the dactyli of the last three pairs of feet armed with a long subterminal spinule, which, folding against the slender tip of the dactylus, gives the appearance of a minute chela.

Dimensions.—Length of egg-laden female 83 mm., length of carapace and rostrum 37.6 mm., length of rostrum 23.2 mm.

Type locality.—Off Cape St. James, Queen Charlotte Islands, British Columbia, 876 fathoms, station 2860, U. S. Fish Commission steamer *Albatross* (Cat. No. 25274).

Distribution.—From Bering Sea to Oregon, 109 to 987 fathoms.

SPIRONTOCARIS STONEYI.

A small species near *S. cristata* (Stimpson). Rostrum about half as long as carapace, upper margin convex, armed with 7 to 9 teeth (1 to 2 on carapace), unarmed and straight near tip; tip pointed; one tooth near tip below. A strong antennal, a slender pterygostomial spine. Antennular peduncle reaching to middle of antennal scale; second segment one and a half times as long as third; outer scale not reaching end of first segment. Antennal scale as long as carapace, spine reaching as far as blade; peduncle reaching to a little beyond first segment of antennular peduncle. Fourth abdominal somite

unarmed; sixth somite more than one and a half times as long as fifth and equal to the telson, which has three pairs of lateral spines.

Dimensions.—Female, length 20 mm., length of carapace and rostrum 5.5 mm., of rostrum 1.8 mm.

Type locality.—Bering Sea, latitude $62^{\circ} 15'$ north, longitude $167^{\circ} 48'$ west, $20\frac{1}{2}$ fathoms, Lieut. George M. Stoney, U. S. N., collector, June, 1884 (Cat. No. 25275).

SPIRONTOCARIS MACROPHTHALMA.

Allied to *S. macilenta* (Krøyer) and *S. bispinosa* Holmes. Rostrum about three-fourths or five-sixths as long as carapace, upper and lower limbs with convex margins and widest at about the middle of their length; 10 to 14 teeth above (2 or 3 on carapace), 1 to 3 spines below; tip acute. No supraorbital nor pterygostomian spine. Eyes large, pyriform, corneæ extending almost to base of eyestalk on inner side, eye reaching two-thirds length of first antennular segment; this segment twice as long as second, and second three times as long as third. The blade of the antennal scale exceeds the spine considerably, and is most advanced toward its inner margin. Outer maxillipeds slender, reaching midway between end of antennal peduncle and end of scale. Last three pairs of feet long, fragile, unarmed.

Differs from *S. macilenta* in the much larger eyes, longer rostrum, of which the upper limb is narrowed at its base; from *S. bispinosa* in the absence of a supraorbital spine and of the long slender process of the rostrum.

Dimensions.—Female, length 62.6 mm., length of carapace and rostrum 24 mm., of rostrum 11 mm.

Type locality.—Off Tawhit Head, Washington, 178 fathoms, station 3076, U. S. Fish Commission steamer *Albatross* (Cat. No. 25276).

Distribution.—Ranges from Unalaska to California, 178 to 636 fathoms.

Family PANDALIDÆ.

PANDALUS JORDANI.

Near *P. borealis* Krøyer. Rostrum similar to that of *P. borealis*, 14 to 17 spines above (4 on carapace), 7 to 10 below. Blade and spine of acicle equally advanced. Carpus of right cheliped of second pair divided into 19 to 22 segments; of left cheliped, into 58 to 63 segments. Dactyli of last three pairs of feet contained from $2\frac{1}{2}$ to $2\frac{3}{4}$ times in their propodi. Third abdominal somite carinated in its posterior half, and with a slight lobe at the posterior third, which may almost disappear in large specimens.

Dimensions.—Ovigerous female, length 124.5 mm., length of carapace and rostrum 59.5 mm., of rostrum 38 mm.

Type locality.—Off Santa Cruz Island, California, 155 fathoms, station 2949 (Cat. No. 25277).

Distribution.—From Unalaska to southern California, 35 to 178 fathoms.

PANDALUS MONTAGUI TRIDENS.

Differs from *P. montagui* Leach of the North Atlantic in its somewhat longer rostrum, which varies from $1\frac{1}{2}$ to $1\frac{2}{3}$ times length of carapace, the dorsal spines terminate behind the middle of the rostrum and the tip is usually trifid, while in typical *P. montagui* the rostrum is from $1\frac{2}{5}$ to $1\frac{1}{2}$ times the carapace, its dorsal spines reach to or in front of the middle, and the tip is bifid.

Dimensions.—Female, length 104 mm., length of carapace and rostrum 48.5 mm., of rostrum 30.2 mm.

Type locality.—Off North Head, Akutan Island, Alaska, 72 fathoms, station 2842, U. S. Fish Commission steamer *Albatross* (Cat. No. 25278).

Distribution.—From Bering Sea to Point Arena, California, 3 to 351 fathoms, abundant.

PANDALUS STENOLEPIS.

Near *P. danæ* Stimpson. Differs in the stouter eyes, the transverse diameter as great as axial diameter; in the more slender acicle, which has a concave outer margin, and distal half of blade very narrow and filiform, narrower than adjacent thickened portion; in the longer feet of first pair, reaching almost to extremity of maxillipeds; in the third, fourth, and fifth pairs of feet of the male, which, while shorter than those of the female, as in *P. danæ*, do not, as in that species, differ in shape from those of the female; in the tip of the rostrum, usually two-spined instead of three-spined.

Dimensions.—Adult female, length 80 mm., length of carapace and rostrum 37.2 mm., of rostrum 21 mm.

Type locality.—Straits of Fuca, 40 fathoms, station 3464, U. S. Fish Commission steamer *Albatross* (Cat. No. 25279).

Distribution.—From Aleutian Islands to Oregon, 27 to 125 fathoms.

PANDALOPSIS ALEUTICA.

Allied to *P. ampla* Bate and *P. lamelligera* (Brandt). Surface pubescent. A curved, longitudinal branchial ridge present. Superior spines 8 to 13, 4 to 6 behind orbits, the insertion of the posterior spine at middle of carapace, anterior spine (exclusive of a subterminal spine) behind middle of rostrum; inferior spines 8 to 12. Peduncle of antennula extends a little past middle of antennal scale; second segment $1\frac{1}{2}$ times as long as third. Peduncle of antenna reaching to end of second segment of antennula; scale three-fourths to four-fifths as long as carapace, broader behind than in *P. ampla*. The outer

maxillipeds extend either to the tip or nearly to the tip of antennal scale. Feet of second pair subequal, carpal segments 18 to 21. Third, fourth, and fifth pairs of feet subequal, dactyli subequal.

Dimensions.—Adult female, length 132 mm., length of carapace and rostrum 61.5 mm., of rostrum 33 mm.

Type locality.—Off Segouam, Aleutians, 283 fathoms, station 3480, U. S. Fish Commission steamer *Albatross* (Cat. No. 25280).

PANDALOPSIS LONGIROSTRIS.

Near *P. aleutica*. Rostrum more than twice the length of remainder of carapace, strongly upturned. Antennal scale as long as carapace. Chelæ of second pereopods with fingers almost as long as palm.

Dimensions.—Male, length 112 mm., length of carapace and rostrum 59 mm., of rostrum 41 mm.

Type locality.—Off Iliuliuk Harbor, Unalaska, 309 fathoms, station 3316, U. S. Fish Commission steamer *Albatross* (Cat. No. 25690).

PANDALOPSIS DISPAR.

Rostrum from 2 to $2\frac{1}{2}$ times as long as the rest of the carapace; superior spines 16 to 21, 3 or 4 on carapace, posterior spine at anterior third of carapace, spines extending along whole length of rostrum; inferior spines 9 to 15, tip bifid. Carpal segments of second pair of feet, 26 to 33. Third, fourth, and fifth pairs of feet nearly equal, their propodi increasing in length in the order named, while the dactyli increase in reverse order. Outer branch of swimming fan about as long as telson; inner branch much shorter.

Dimensions.—Length of female 181 mm., length of carapace and rostrum 100.5 mm., of rostrum 73.5 mm.

Type locality.—Chernoffski Harbor, Unalaska, 109 fathoms, station 3324, U. S. Fish Commission steamer *Albatross* (Cat. No. 25281).

Distribution.—From Bering Sea to Washington, 53 to 351 fathoms.

Family PONTONIIDÆ.

PONTONIA CALIFORNIENSIS.

Rostrum more than one-third the length of remainder of carapace, very narrow, deflexed, reaching middle of second antennular segment; this is one and a half times as long as third, both together half as long as first. Antennal scale scarcely exceeding antennular peduncle; antennal peduncle reaching end of scale. Of the first pair of feet the merus and carpus are subequal, the propodus a little shorter than the carpus, palm and fingers subequal. Right foot of second pair missing, merus of left foot short and stout, carpus cup-shaped, palm and fingers subequal in length, palm two-thirds as broad as long, fingers

gaping, prehensile edges denticulate, fringed with long hair. Dactyli of last three pairs of feet provided with a subterminal and a terminal spine. Telson twice as long as sixth somite, two pairs of long lateral appressed spines inserted on anterior half.

Dimensions.—Length of carapace and rostrum 6.7 mm., of rostrum 1.8 mm., of abdomen 9 mm.

Type locality.—Off Santa Cruz Island, California, 30 fathoms, station 2945, U. S. Fish Commission steamer *Albatross* (Cat. No. 25282).

Family PALÆMONIDÆ.

PALÆMONETES KADIAKENSIS.

Rostrum about as long as carapace, 6 or 7 teeth above (1 behind orbit), 2 or 3 below. Antennular peduncle reaching about four-fifths the length of antennal scale. Scale as long, or nearly as long, as carapace, oblong, blade projecting considerably beyond scale. Outer maxillipeds very slender, reaching when extended only a small bit beyond antennal peduncle. Feet of first pair nearly to end of scale, carpus longer than merus, and more than twice as long as propodus, fingers and palm subequal. Feet of second pair reaching beyond scale by half length of propodus, carpus $1\frac{1}{2}$ times merus, propodus three-fourths of carpus and no wider than in the first pair, fingers shorter than palm. Sixth abdominal somite twice as long as fifth and as long as telson.

Dimensions.—Length of female, 39 mm., of carapace and rostrum 15 mm., of rostrum 7 mm.

Type locality.—Kadiak Island, Alaska, under stones at low water; William J. Fisher, collector (Cat. No. 6246).

UROCARIS INFRASPINIS.

General appearance of *U. longicaudata* Stimpson. Differs in having an antennal spine on the carapace, a distinct ocellus outside the cornea, in having the palm and fingers of the first pair of feet subequal, the carpus of the second pair subequal to the merus, the palm a little shorter and the fingers still shorter, and in having the sixth abdominal somite shorter than the carapace (rostrum excluded) and less than twice as long as fifth somite.

Dimensions.—Female with eggs, length of carapace and rostrum 6 mm., of rostrum 2.5 mm., of abdomen 15 mm.

Type locality.—Gulf of California in Concepcion Bay, Lower California, U. S. Fish Commission steamer *Albatross* (Cat. No. 25283).

Distribution.—San Diego Bay, California, and Gulf of California.

Family OPLOPHORIDÆ.

HYMENODORA FRONTALIS.

Surface covered with very fine wrinkles or rugose lines. Rostrum from two-fifths to one-half as long as remainder of carapace, reaching end of antennular peduncle; it is a slender sharp-pointed spine, distal half slightly curved upward, basal half armed above with from 3 to 6 small spines (2 or 3 on carapace). Antennular spine minute; antennal spine strong; from it a sharp carina runs back subparallel to the side margin and quite to the posterior margin. A blunt ridge on the branchial region. A deep groove extends obliquely downward and backward from the orbital sinus nearly to the lateral carina. Eyes without pigment, with a slender blunt spine on inner margin. Antennal scale lanceolate; peduncle reaching end of first antennular segment. Abdomen devoid of a median carina or median spines; sixth somite $2\frac{1}{2}$ times as long as fifth and between three-fourths and four-fifths as long as telson.

The unusually long rostrum distinguishes this from other species of *Hymenodora*.

Dimensions.—Male, length of carapace and rostrum 19 mm., of rostrum 6.5 mm., of abdomen 32.5 mm.

Type locality.—West of Unalaska, 322 fathoms, station 3327, U. S. Fish Commission steamer *Albatross* (Cat. No. 25284).

Distribution.—From Bering Sea and Kamchatka to off Monterey Bay, California, 322 to 1,771 fathoms.

Family PASIPHÆIDÆ.

PARAPASIPHÆ SERRATA.

Allied to *P. gilesii* Wood-Mason. Carapace and rostrum as long as first five abdominal somites. The median carina extends backward to the posterior fifth of the carapace and forward along the high thin rostrum, which extends to middle of eyestalks; carina a little concave at middle of carapace, anteriorly sloping downward and armed with 16 small teeth or spines, two of which are on the rostrum and one is terminal; below this spine the rostrum is a compressed finely crenulate lobe. Antennular scale as long as basal joint of peduncle. Antennal scale nearly half as long as carapace proper. Fingers of first pair of feet equal to palm in length; third pair (tip broken off) equal to carapace exclusive of rostrum; fourth and fifth pairs have the terminal joint narrow-oval, fifth pair the longer and two-thirds the length of carapace. First three abdominal somites noncarinate, fourth terminating in a thin compressed spine.

Dimensions.—Egg-laden female, length of carapace and rostrum 23.6 mm., rostrum 1.8 mm., abdomen 42 mm.

Type locality.—Off Cortez Bank, California, 984 fathoms, station 2919, U. S. Fish Commission steamer *Albatross* (Cat. No. 25285).

PASIPHÆA PACIFICA.

Carapace distinctly carinated, carina anteriorly sharp and terminating in a rather slender sharp-pointed tooth or spine, which falls far short of the anterior margin. The branchiostegal sinus is an obtuse angle; the branchiostegal spine is situated over the angle of the sinus. Eyes dark brown. The merus of the first pair of feet is either unarmed or may have one to three spines. First abdominal somite noncarinate; second to sixth, inclusive, carinate; telson four-fifths as long as sixth somite; its extremity has a deep notch.

Dimensions.—Female, length 64.8 mm., carapace 20.3 mm.

Type locality.—Off Point Sur, California, 328 fathoms, station 3186, U. S. Fish Commission steamer *Albatross* (Cat. No. 25286).

Distribution.—From Unalaska to Gulf of California in 53 to 399 fathoms.

PASIPHÆA EMARGINATA.

Near *P. faxoni* (new name = *P. acutifrons* Faxon, not Bate). Differs in longer carapace, which is equal to the first five segments and one-half of the sixth segment of the abdomen; more sinuous branchial ridge; less prominent median carina; smaller gastric tooth; longer telson, which has a very shallow notch, scarcely forked.

Dimensions.—Length of female 81 mm., length of carapace 33.3 mm.

Type locality.—Gulf of California, 857 fathoms, station 3009, U. S. Fish Commission steamer *Albatross* (Cat. No. 25552).

PASIPHÆA CORTEZIANA.

Carapace very bluntly carinated behind gastric tooth, which is dentiform and does not overreach margin of front; branchiostegal spine near antero-lateral angle, just behind anterior margin; antero-lateral sinus forming an obtuse angle; eye-stalks slightly enlarged distally, eyes reddish brown; abdomen not carinated; telson with a deep notch.

Dimensions of male.—Length 64 mm., length of carapace 23.8 mm.

Type locality.—Near Cortez Bank, California, 776 fathoms, station 3627, U. S. Fish Commission steamer *Albatross* (Cat. No. 25553).

PASIPHÆA AFFINIS.

Differs from *P. corteziana* in its shorter carapace (equal to the first four and half the fifth segment of the abdomen), without median carina, and in the abdomen being carinated.

Dimensions.—Length of male 67 mm., length of carapace 22 mm.

Type locality.—Near Cortez Bank, California, 984 fathoms, station 2919, U. S. Fish Commission steamer *Albatross* (Cat. No. 25691).

A NEWLY FOUND METEORITE FROM ADMIRE, LYON COUNTY, KANSAS.

By GEORGE P. MERRILL,
Head Curator of Geology.

Concerning the fall of the meteorite here described, little if anything is definitely known, the material being plowed up in a very badly oxidized condition, indicating that it had laid for a long time in the soil. A correspondent informs me that some thirty years ago a meteorite was seen to fall in the vicinity, but nothing was found at the time. It is possible that this may be the material, for certainly its condition would indicate that it must have been exposed for many years.

The first piece found was plowed up by Mr. W. Davis, of Admire, Kansas, about ten years ago, the original mass weighing some 12 or 15 pounds. This was all broken up and lost, with the exception of some 432 grams obtained by the United States National Museum.

In addition to these there were obtained three masses weighing, respectively, 2,048, 5,460, and 6,720 grams. There is known to be in existence another oxidized mass weighing upward of 7,000 grams. It is safe to assume that not less than 30,000 grams must at some time have been in existence, though the total weight can never be accurately ascertained.

The distribution of the pieces found, together with their corresponding weights, so far as I have been able to gather them, was as follows:

Town- ship.	Range.	Section.	Weight.
			<i>Grams.</i>
16	12	35	6,725
16	12	36	7,280?
16	12	25	2,048
16	12	14	432
16	17	1	5,460

On casual inspection the masses found have the appearance of ordinary limonite segregations and nothing to suggest their meteoric origin. (See Plate L.) The specimens are deeply fissured. On breaking a

mass open it is found to consist of metallic iron and olivine, both in such quantities as to be readily determined by the unaided eye. Cut and polished specimens show it to be a pallasite and to belong to Brezina's Rôkicky group, of which the meteorite of Eagle Station, Carroll County, Kentucky, is the only representative thus far found in America. In fact, the Admire meteorite is the third representative of the group thus far known.

A polished surface brings out very plainly the mineral composition, and presents some exceedingly interesting structural peculiarities. (Plates LI and LII.) The silicate mineral is olivine, which occurs in single crystals and aggregates from 1 to 30 millimeters in diameter. These are almost universally fractured, and many of them are in a decidedly sharply angular condition. The proportional amount of iron varies considerably, but as a rule probably constitutes one-third in bulk of the mass and occupies the position of a binding or cementing constituent. Schreibersite is comparatively abundant and easily distinguishable by its luster from the metallic iron. Troilite in sporadic patches is common, and there is also a fairly abundant scattering of chromite granules in sizes up to $1\frac{1}{2}$ millimeters in greatest diameter. All but the last named are readily distinguished by the unaided eye on a polished surface.

A freshly cut surface of the meteorite shortly becomes coated here and there with a greenish exudation which reacts for chlorine and iron, and is undoubtedly lawrencite. This exudes sometimes from the mass of the iron itself, but is more abundant along the line of separation between the iron and schreibersite plates. It is very abundant and undergoes such ready oxidation that polished surfaces are quickly tarnished, and it has become necessary to protect the samples by immersing them in paraffin. Once thoroughly soaked in paraffin, however, they do not seem to undergo further deterioration.

The above completes the list of determinable mineral constituents.

A most striking feature of the meteorite is the brecciated condition of the olivine, as shown in Plates LI and LII. The angular character of the particles is even more pronounced than in the Eagle Station meteorite. The brecciation, however, is scarcely that of a rock which has been subjected merely to ordinary crushing; it is more like that which one could conceive to have been brought about by the sudden plunging of a hot body of low heat-conducting power into an intensely cold medium, or the opposite.

A very important feature is that the native iron, schreibersite, and troilite often penetrate the silicates along these lines of fracture, as shown in Plate LIII, fig. 1. The threads or veinlets of iron and schreibersite vary from a mere line to a width of 1 or 2 millimeters, and indicate beyond question a solidification and perhaps reduction subsequent to the shattering of the crystals. Under the microscope what

are plainly portions of the same crystal, but slightly separated and with almost identical optical orientation, are seen with thin veinlets of iron or schreibersite traversing the fracture lines, as shown in Plate LIV. I can not discover that there exists any constant proportional relationship between these two minerals, although the iron is by far the more abundant, and the schreibersite, while sometimes in thin plates, is also present in granular forms.

The metallic minerals often occur associated in a peculiarly suggestive manner. This may be best understood by reference to Plate LV, which is from a photographic enlargement of about five diameters. The broad, white outer band (1) is of nickeliferous iron. Inside this is a dark area (3) interspersed with iron in the form of rounded blebs and dashes. Between the iron and the dark interiors are always thin metallic plates (2), at first thought suggestive of tænite, but which chemical tests have shown to be invariably schreibersite. They do not show in the illustration, though very evident on a polished surface. The gray interior matter is not in all cases homogeneous. When subjected to friction the outer portions—white in the figure—quickly take a highly lustrous, fairly lasting polish. The interiors come up more slowly, are less lustrous, often showing under the glass a surface of minute metallic points interspersed with others without luster—that is, which take no polish, indicating a lack of homogeneity in the material. Often a central portion of the area has seemed to be more compact and more homogeneous than that nearer the margins, though one portion grades into another without sharp lines of separation. (See Plate LI, fig. 2-a.)

On exposure some of these areas quickly tarnish, while others hold their dull polish for a considerable length of time. Those which tarnish most quickly exude a greenish material, which reacts for chlorine, and which, when washed away, leaves the iron beneath of a dull black color and pitted. The conclusion is inevitable that in such cases the material is a spongy mass of metallic iron and iron chloride, presumably lawrencite. Other portions, again, seem to be like spongy mixtures of iron and iron sulphide, and still others nearly pure iron.

Attention should here be called to the spicules of iron (4 on Plate LV) which are seen extending from points of attachment on the white metallic portion inward and in some cases nearly across this gray interior area, which has been described as composed in part of lawrencite. These spicules have all the appearances of incipient stages of crystallization where the process has been arrested before completion. They resemble greatly in their general appearance frost crystals which are to be seen upon the windowpane in cold weather, or acicular crystals forming on the surface of pools of quiet water.

The iron on etching, it should be stated, does not yield the Wid-

manstättian figures, but there is brought out a prominent line of demarcation between the outer zone of iron and the inner, very brilliant thin plate which, though suggestive of *tænite*, proves to be *schreibersite*, as already noted.¹ So far as I have been able to determine, but one nickel-iron alloy exists, that corresponding most nearly to *kamacite*, as noted below.

The general structure of the meteorite, as revealed by the microscope in thin sections, is shown on Plate LIV. Weathering, as already noted, has produced extensive alteration in the metallic portions of the rock. Naturally, the *lawrencite* has been the first to yield, and following this, the *troilite* and native iron, the *schreibersite* being left standing in relief and quite conspicuous.

The first product of the oxidation of the iron is not *limonite*, but a highly lustrous—on polished surfaces, blue—material which crushes down readily to a fine brown magnetic powder.² On further exposure this goes over into ordinary *limonite*. Where the oxidation has gone on largely, the silicates are shattered, and veins of the oxidized material traverse them in every direction, producing a network of fine lines which, in the thin sections, show up with a pronounced blue reflection, at first scarcely distinguishable from the native iron itself.

A chemical analysis of the meteorite as a whole has not been attempted, as it was felt such would be of little value, owing to its extremely coarse nature and the varying proportions of metallic and silicate constituents. Carefully separated bits of the *olivine*, free from inclosures or oxidation products, yielded the following results:

	Per cent.
SiO ₂	39.14
MgO	47.63
FeO	13.185
Total	99.955

This *olivine*, in the thin section, it may be well to note, showed at times a well-defined and quite regular pinacoidal cleavage, which, on basal sections, so closely resembled the prismatic cleavage of *enstatite*, that the true nature of the mineral was ascertained only by noting the position of the plane of the optic axes.

The analyses given below were made for me by Mr. Wirt Tassin, assistant curator in the Division of Mineralogy. A portion of the mass relatively rich in iron was taken. This was carefully cleansed mechanically from any visible traces of silicates or oxidation products, the cleansed material amounting to 3.3209 grams. Of this 0.07

¹ The investigations on this meteorite and on that of Casas Grandes, studied by Mr. Tassin, lead us to feel that *schreibersite* occurs more frequently in thin plates, simulating *tænite*, than is commonly supposed.

² This agrees with observations made by J. Lawrence Smith in 1875 on other irons. See Original Researches, pp. 480-486.

gram consisted of small black grains, later identified as chromite, the soluble portions separated from which amounted to 3.2509 grams. From this the following percentages were obtained:

	Per cent.
Fe	93
Ni	6
Co	0.02
S	0.03
P	0.025
Cu	Trace.

This corresponds to:

Nickeliferous iron (Fe, Ni, Co, Cu, etc.)	98.273
Schreibersite (Fe, Ni) ₃ P	1.645
Troilite, FeS	0.082
	100.00

The chromite obtained from various portions as a result of mineralogical separations was purified so far as possible by treatment with acids, and 1.025 grams taken for analysis. This gave results as follows:

	Per cent.
Cr ₂ O ₃	65.49
FeO	33.00
MgO	0.40
SiO ₂	0.50

It is a fair assumption that the magnesia and silica here shown belong to included olivine.

A fresh sample, weighing 2.05 grams, yielded 0.028 per cent of chlorine, equivalent to 0.05 per cent of lawrencite. No traces of tin, platinum, or manganese could be detected.

Specific gravity determinations made on masses weighing from 117.5 to 139.35 grams, were found to vary from 3.95 to 4.2. The iron, it should be noted, was quite active, taking quickly a coating of metallic copper when treated to a solution of copper sulphate.

I can but feel that a great deal of importance may be attached to the peculiar structural features shown by this meteorite and the association of the metallic constituents. These latter have been plainly introduced since the first consolidation, and subsequent to the shattering of the olivines. They occupy the position of a binding constituent in a siliceous breccia.

The source of the metallic constituents of meteorites has long been a matter of speculation, though it has been suggested by various authorities that it might result from the reduction of an iron-rich silicate. There is nothing in the present case to suggest any such origin, and it would seem to the writer much more probable that it should come from the lawrencite and troilite. That a portion of it thus resulted, is, it seems to me, extremely probable, from the conditions shown in Plate LV, above noted, in which we have the acicular

forms starting from the metallic borders at the right and extending inward into the spongy mass of the interior. The appearance in every way suggests the beginnings of crystallization, which have been interrupted by changed conditions. If I am right in this, the Admire meteorite, as it will be known, is by far one of the most important and interesting of recent finds.

This find adds one more to the long list of meteorites for which Kansas is becoming noted, making eleven thus far reported. Attention has been called to this remarkable condition of affairs by Preston, from whose paper¹ the following table is taken, with the addition of the Admire fall here described:

Tonganoxie, Leavenworth County	kilos..	11.5
Brenham, Kiowa County	kilos..	900.0
Farmington, Washington County	kilos..	84.0
Ottawa, Franklin County	grams	876.0
Waconda, Mitchell County	kilos..	26.0
Oakley, Logan County	do...	27.9
Ness County	do...	10.9
Kansada (Ness County)	do...	9.2
Jerome, Gove County	do...	31.4
Prairie Dog Creek, Decatur County	do...	2.9
Long Island, Phillips County	do...	534.6
Admire, Lyon County	do...	22.0

In order to bring out more plainly the striking features of the case, I append hereto a map of the region, on which the positions of the various falls are approximately noted. (Plate LVI).

The Kansada stone should probably be considered a part of the Ness County fall. The amount of the Ness County material, as given by Preston, has been very considerably increased, the United States National Museum alone having eleven stones, weighing altogether 2,044 grams.

It is possible, indeed probable, that this condition of affairs is not so remarkable or anomalous as may at first appear, since, as is well known, Kansas is a country but little forested, in which the surface rocks, so far as exposed, are of a calcareous or sandy nature, and in which the drift is, as a whole, small and inconspicuous. Hence, in plowing, any unusual boulder turned up would naturally excite the interest of the inhabitants. More than this, the prices which dealers have been willing to pay for the materials have naturally excited the interest of the agriculturists, who, having their wits sharpened, are continually on the lookout for new materials. It is safe to say that the same number of falls might have occurred in other States, and, under less favorable conditions, the materials been entirely overlooked.

¹ Am. Jour. Science, IX, June, 1900, pp. 410-412.

EXPLANATION OF PLATES.

PLATE L.

- Fig. 1. The 5,460-gram mass, as found.
 2. The 6,725-gram mass, as found.

PLATE LI.

The 2,048-gram mass, cut in halves. Size of faces shown, about 10 by 11 cm. The enlarged area shown in Plate LV appears at a spot just above and to the right of the center in fig. 1. In fig. 2, just to the left of center, are shown like areas consisting exteriorly of metallic iron with interiorly the spongy iron and lawrencite. This last shows the interior, more compact, central portion mentioned on page 909.

PLATE LII.

Slice, slightly reduced, from the 6,725-gram mass shown in fig. 2 of Plate L. The dark areas are olivine; the white, the metallic portions.

PLATE LIII.

Photographic enlargement of about three diameters. The dark areas are in all cases olivine; the white (1), nickel-iron; (2), schreibersite; and (3), troilite.

In fig. 1 a large fractured olivine is shown in the lower center, with nickel-iron (1) above, which extends downward into the fracture for a distance of about 1 millimeter, where it stops abruptly, the remainder of the fracture being occupied by schreibersite (2). In fig. 3 the schreibersite (2) is shown both in granular form and as a thin plate lying between the troilite (3) and nickel-iron (1).

PLATE LIV.

Photomicrographs of thin sections enlarged about ten diameters. The colorless areas (1) are olivine; the white lines (2), schreibersite; the dark areas (3), bordered by schreibersite (2), are troilite. The other dark, nearly black areas, not numbered, are secondary iron-oxides.

PLATE LV.

Photographic enlargement of about five diameters. The dark outer areas are olivine; the white (1), nickel-iron. The dark areas (3) within the nickel-iron are spongy aggregates of iron, lawrencite, or troilite. Extending outward from the metallic portions and into the spongy mass are acicular crystals of nickel-iron (4). Between the nickel-iron (1) and the spongy areas is commonly a thin plate of schreibersite (2), which can not, in the illustration, be differentiated from the nickel-iron.

PLATE LVI.

Outline county map of Kansas, showing sources of the various meteorite finds and falls.

Fig. 1. Tonganoxie, Leavenworth County (iron).....	kilos..	11.5
2. Brenham, Kiowa County (pallasite).....	do....	900.0
3. Farmington, Washington County (stone).....	do....	84.0
4. Ottawa, Franklin County (stone).....	grams..	876.0
5. Wacanda, Mitchell County (stone).....	kilos..	26.0
6. Oakley, Logan County (stone).....	do....	27.9
7. Ness County (stone).....	do....	10.9
8. Kansada, Ness County (stone).....	do....	9.2
9. Jerome, Gove County (stone).....	do....	31.4
10. Prairie Dog Creek, Decatur County (stone).....	do....	2.9
11. Long Island, Phillips County (stone).....	do....	534.6
Admire, Lyon County (pallasite).....	do....	22.0

The area of the State is given as 81,318 miles, the average length being 400 miles and the average width 200 miles.



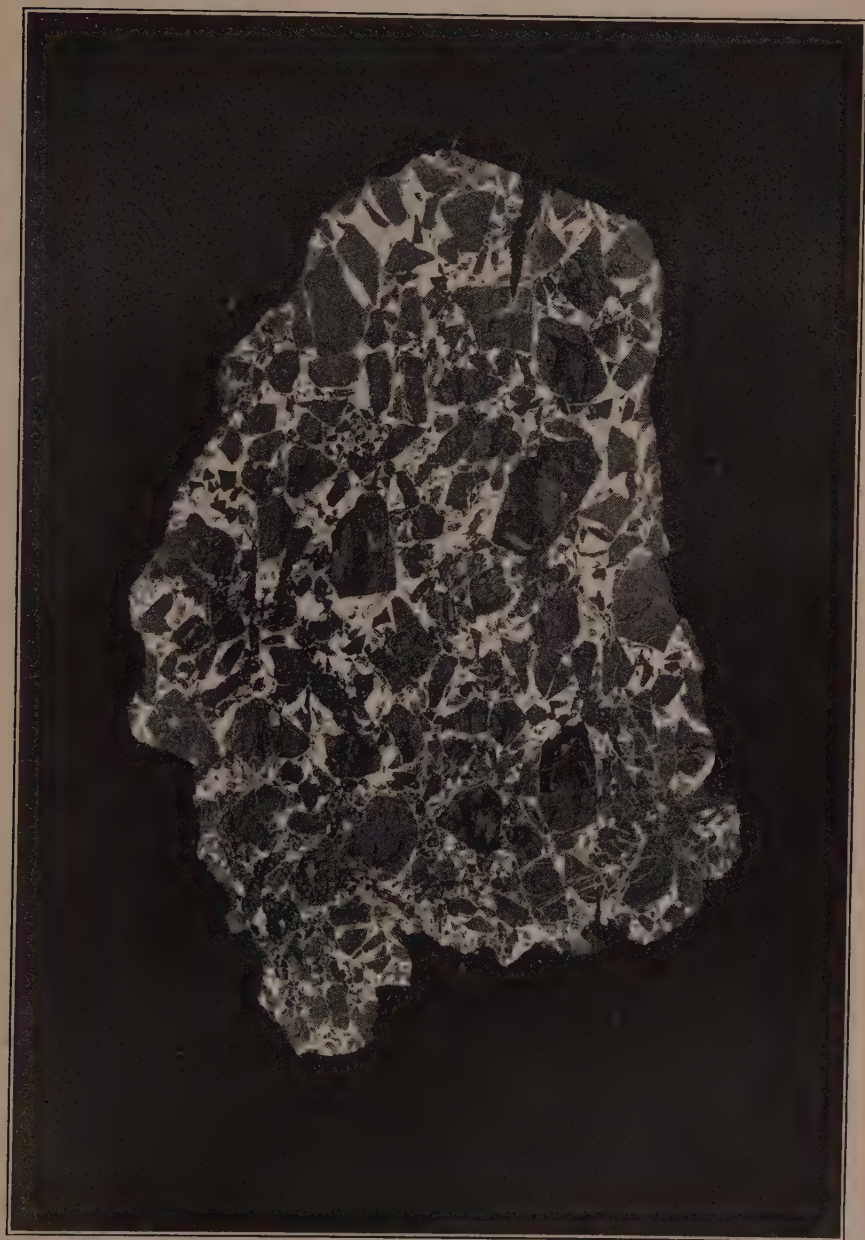
ADMIRE METEORITE.

FOR EXPLANATION OF PLATE SEE PAGE 913.



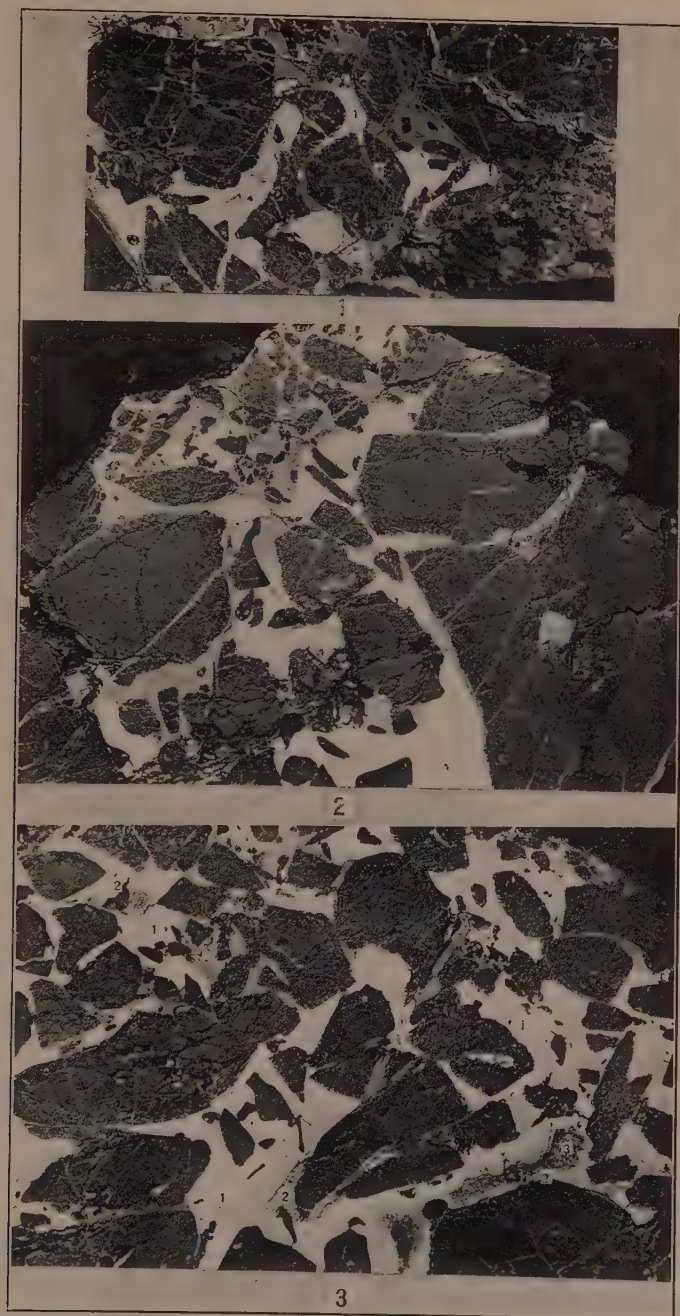
ADMIRE METEORITE.

FOR EXPLANATION OF PLATE SEE PAGE 913.



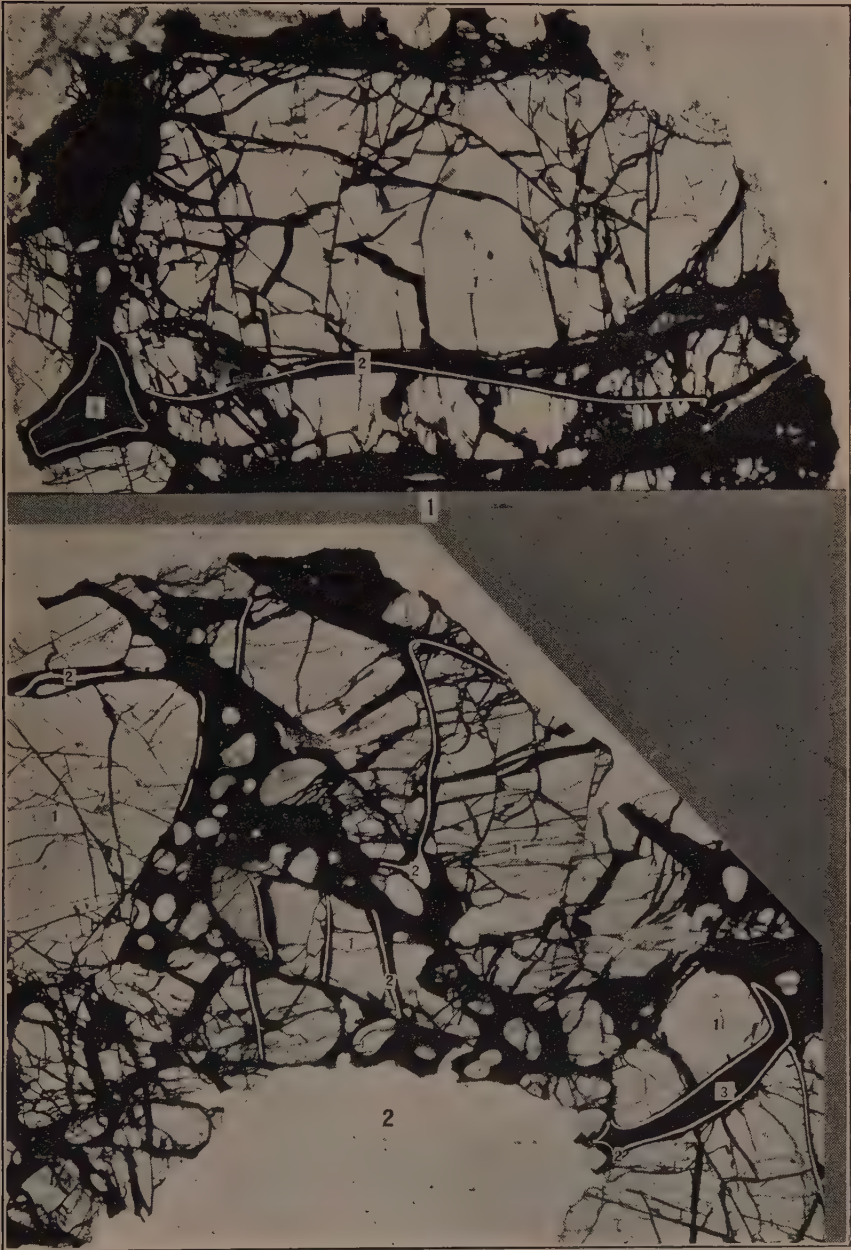
ADMIRE METEORITE.

FOR EXPLANATION OF PLATE SEE PAGE 913.



ADMIRE METEORITE.

FOR EXPLANATION OF PLATE SEE PAGE 913.



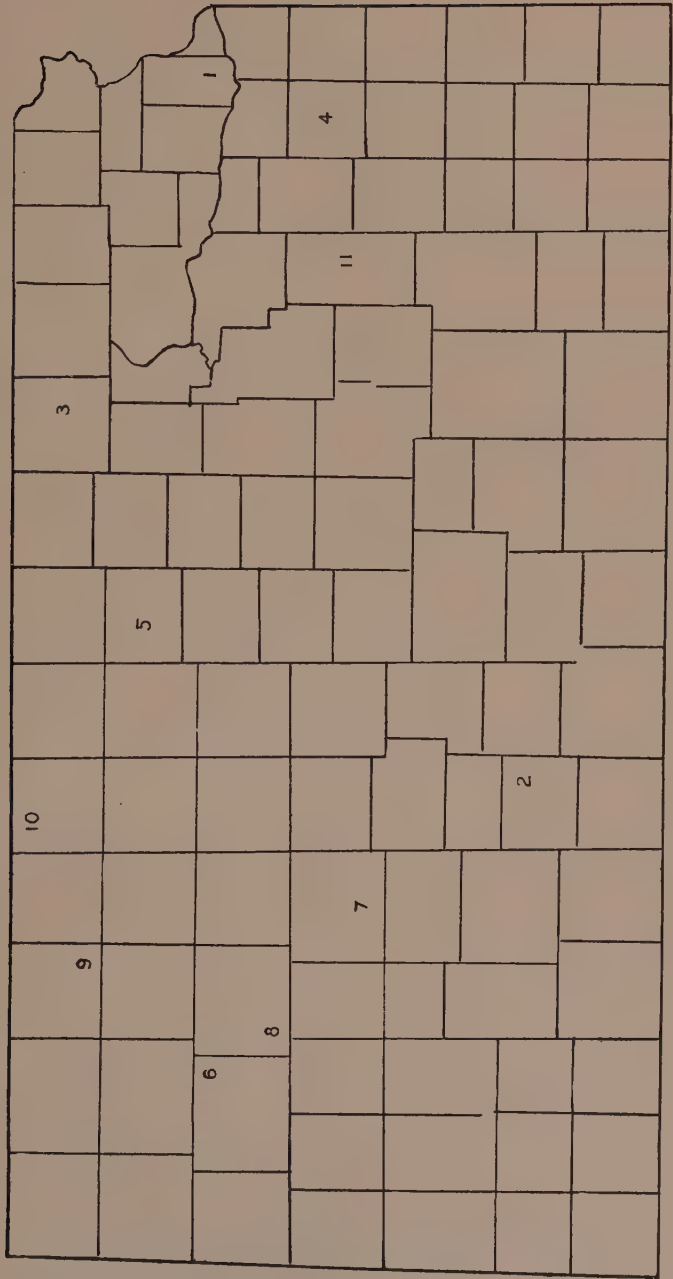
ADMIRE METEORITE.

FOR EXPLANATION OF PLATE SEE PAGE 913.



ADMIRE METEORITE.

FOR EXPLANATION OF PLATE SEE PAGE 913.



OUTLINE MAP OF KANSAS, SHOWING METEORITE FINDS AND FALLS.

FOR EXPLANATION OF PLATE SEE PAGE 913.

DESCRIPTIONS OF THREE NEW BIRDS FROM THE SOUTHERN UNITED STATES.

By EDGAR A. MEARNS,

Major and Surgeon, United States Army.

Two birds which I collected in Florida during the winter and spring of 1901 prove to be new to science. These are here described, together with a new nuthatch from Arizona.

COTURNICULUS SAVANNARUM FLORIDANUS, new subspecies.

FLORIDA GRASSHOPPER SPARROW.

Type.—No. 176981, U.S.N.M. collection. Adult male, taken April 23, 1901, on the Kissimmee Prairie, 7 miles east of Alligator Bluff, Osceola County, Florida, by Edgar A. Mearns. Original number, 12531.

Characters.—Similar to *Coturniculus savannarum passerinus* (Wilson), but smaller, with larger bill, longer tarsus, and much darker coloration above, paler below; chestnut of upper surfaces much reduced in amount, and replaced by black; lateral dark areas of crown almost solid black; spotting of nape and scapulars almost black; interscapular region much blacker than in *Coturniculus savannarum passerinus*.

Measurements of type (adult male).—Length, 132 mm.; alar expanse, 210; wing, 63; tail, 49; chord of culmen, 12; tarsus, 21; middle toe with claw, 18. See table for comparative measurements (p. 917).

Geographic range.—The Florida grasshopper sparrow breeds commonly on the prairies of the Kissimmee Valley, Florida, from Kissimmee City south to Alligator Bluff, and east to the headwaters of the St. Johns River, north of Lake Okeechobee. I found it especially numerous on the Kissimmee Prairie, where young of the year were on wing as early as April 21, 1901. Mr. W. E. D. Scott seems to have found this form in the Caloosahatchie region of Florida,¹ and perhaps

¹The Auk, IX, July, 1894, p. 23.

at other places.¹ Grasshopper sparrows were also found by Mr. Mortimer about Sanford, Orange County, Florida, in March, 1889,² which may have been the breeding form, as I found them mated early in March. Mr. Chapman found only northern migrants between November 27 and May 27, at Gainesville, Florida.³

Comparisons.—*Coturniculus savannarum savannarum* (Gmelin), the resident form of Jamaica and Porto Rico, is much paler above, and much more ochraceous below. The bill of the Jamaican bird is perceptibly larger. The characters given above readily separate *floridanus* from the forms *passerinus* and *bimaculatus* (= *perpallidus*). *Coturniculus obscurus* (Nelson), while an intensely colored form, as dark above as the present one, differs in being smaller, and in having the underparts strongly buffy and sharply streaked on the breast, the wings and tail being much shorter, and the edge of the wing more intensely yellow. I refer only to the males of *Coturniculus obscurus*, two species being confounded, apparently, in the original description.

Remarks.—I am indebted to Mr. Gerrit S. Miller, jr., for kindly comparing the type of *Ammodramus australis* Maynard,⁴ in his possession, with *passerinus* and *floridanus*. The type of *australis*, which came from Nassau, island of New Providence, Bahama group, proves to have been a typical migrant of *Coturniculus savannarum passerinus*, which migrates to the Bahamas, Cuba, and all parts of Florida in winter.

¹ The Auk, VI, Oct., 1889, pp. 321-322.

² Idem, VII, Oct., 1890, p. 342.

³ Idem, V, July, 1888, p. 274; Oct., 1888, p. 398.

⁴ American Exchange and Mart and Household Journal, III, Feb. 5, 1887, p. 69. See also: Ornithologist and Oölogist, XIV, Apr., 1889, p. 60.

*Measurements of five forms of Coturniculus.*¹

COTURNICULUS SAVANNARUM SAVANNARUM (Gmelin).

Museum num.	Collector's number.	Locality.	Date.	Sex and age.	Length.	Alar expanse.	Wing.	Tail.	Culmen (chord).	Tarsus.	Middle toe with claw.	Middle toe.	Depth of bill at base.	Remarks.
.....		Average of 3 males from Jamaica, West Indies.	.....	.....	2108.5	.....	56.9	39.6	11.2	20.1	.....	15	6.9	
.....		One female from Jamaica, West Indies.	.....	.....	2109.2	.....	57.7	39.4	10.9	20.1	.....	15.2	7.1	

COTURNICULUS SAVANNARUM FLORIDANUS, Mearns.

176981.....	12531.....	Kissimmee Valley, Florida.	Apr. 23, 1901	Male ad.	132	210	63	49	12	21	18	.....	.....	Type.
176943.....	12461.....	do.	Apr. 13, 1901	Female ad.	138	203	61	49	12.7	20	19	.....	.....	Breeding.
176942.....	12462.....	do.	do.	do.	130	202	61	49	12.3	20	18.5	.....	.....	Do.

COTURNICULUS SAVANNARUM PASSERINUS (Wilson).

Am. Mus. 1716.....	Putnam County, New York.	May 18, 1878	Male ad.	135	218	60	45	.....	12.2	19.8	.....	.....	.....	Breeding.
Am. Mus. 1715a.....	do.	May 10, 1878	do.	140	220	64	48	.....	12.2	20.6	.....	.....	.....	Do.
Am. Mus. 1715.....	do.	May 18, 1878	Female ad.	136	211	58	45	.....	11.7	19.1	.....	.....	.....	Do.
Am. Mus. 11455.....	Norbeck, Maryland.	.....	Male ad.	130	205	64	47	.....	12	20.5	.....	.....	.....	Do.
Am. Mus. 175347.....	Kissimmee City, Florida.	Feb. 2, 1901	Female ad.	137	210	63	51	.....	12	21	18	.....	.....	Migrant.

COTURNICULUS SAVANNARUM BIMACULATUS (Swainson).

125128.....	7043.....	Fort Snelling, Minnesota.	May 30, 1890	Male ad.	141	224	70	53	12	21	20	.....	.....	
Am. Mus. 7050.....	do.	.....	May 31, 1890	do.	135	219	66	50	12	20	19	.....	.....	
Am. Mus. 6655.....	do.	.....	May 23, 1889	Female ad.	140	221	66	53	12.5	21	18.3	.....	.....	
131290.....	9687.....	Guadalupe Canyon, Sonora, Mexico.	Oct. 4, 1893	Male ad.	135	216	66	50	11.7	19.5	.....	.....	.....	
Am. Mus. 3929.....	.....	Near Gage, New Mexico.	.....	.....do.	131	214	68	50	12	20	18	.....	.....	
Am. Mus. 3839.....	.....	Yavapai County, Arizona.	Mar. 26, 1885	do.	137	225	66	52	12	21	18	.....	.....	
Am. Mus. 3930.....	.....	Near Gage, New Mexico.	Apr. 17, 1885	Female ad.	135	217	68	50	12.5	21	18	.....	.....	

COTURNICULUS OBSCURUS (Nelson).

.....	.....	Average of 12 males.	.....	.....	2114.8	.....	55.1	39.6	11.7	19.1	.....	13.7	7.9	
.....	.....	Average of 4 females.	.....	.....	2123.2	.....	61.5	44.7	11.4	19.6	.....	14.5	7.4	

¹The measurements of single birds are all from fresh specimens by the author; the averages are from Ridgway's Birds of North and Middle America, I, 1901, pp. 206, 209.

²From skins.

PROGNE SUBIS FLORIDANA, new subspecies.

FLORIDA PURPLE MARTIN.

Type.—No. 176800, U.S.N.M. collection. Adult female, collected April 1, 1901, at Lake Kissimmee, southern Florida, by Edgar A. Mearns. Original number, 12399.

Characters.—Smaller than *Progne subis subis* or *P. cryptoleuca*; females averaging much darker in color; upper surfaces (forehead usually included) entirely dark steel blue shaded with violet; under surfaces mouse gray anteriorly, shading to smoke gray on abdomen, whitish in immature females. The coloring of the under parts is frequently so dark as to obscure the dark shaft streaks; and the sides, in old females, are glossed with blue-black.

Measurements of type (adult female).—Length, 208 mm.; alar expanse, 410; wing, 146; tail, 82; chord of culmen, 12; tarsus, 16; middletoe with claw, 22.2. See table (pp. 920-922) for comparative measurements.

Geographic range.—Southern Florida; known only from the St. Johns and Kissimmee valleys.

Remarks and comparisons.—Females of the resident Florida bird are from 5 to 10 mm. less in the wing measurement than those from the northeastern United States. The darkest females of *floridana* are without any white below and lack hoary edgings to the frontal feathers, in which respects they differ from those from other portions of the United States. The younger females from Florida can be matched in color by specimens from the District of Columbia, which, however, are larger; all females of *Progne subis floridana* being smaller than the average of *Progne subis subis* from the District of Columbia. Both sexes of *floridana* are much smaller than the typical *subis* from the northern interior region (Hudson Bay and the Upper Mississippi Valley). In the subjoined table of measurements it is probable that the largest males given under *floridana* are really migrants of *subis*. Mr. Ridgway supposes the extreme phase of *floridana* to be mainly confined to the southern extremity of Florida, south of the localities at which our specimens were obtained, as there are in the series many specimens of intermediate coloration, even among breeding birds. The collection in the United States National Museum has long contained a typical female of the present form, from the middle St. Johns River, marked by Mr. Ridgway, "If not *cryptoleuca* this is a new species. R. R."

The measurements of the 81 specimens enumerated in the following table were all taken by me, on a uniform plan, from fresh specimens. Excepting a few from Wisconsin, they show but slight variation in size in the three subspecies represented, the rest coming from the southern border of the United States, where the species breeds from

océan to ocean. The status of the Arizona martin is unsatisfactory. Its measurements agree closely with those of *Progne subis hesperia* Brewster, except that the tarsus is slightly longer. In coloration its upper parts most resemble *hesperia*, its under parts *subis*.

I am indebted to Mr. Robert Ridgway and the authorities of the United States National Museum for the use of its specimens, to Dr. J. A. Allen for those in the New York American Museum of Natural History, and to Mr. Paul Bartsch for a series of martins from Iowa.

Comparative measurements of three subspecies of Progne subis.
RECORD AND MEASUREMENTS OF SPECIMENS OF *PROGNE SUBIS SUBIS* (Linnaeus).

U. S. National Mu- seum No.	Collector's No.	Locality.	Date.	Sex and age.	Length.	Alar expanse.	Wing.	Tail.	Chord of culmen.	Bill from nostril.	Tarsus.	Middle toe with claw.
17173	17173	Camp Douglas, Juneau County, Wisconsin.	July 26, 1890	Male ad	210	425	150	84	11	8.5	17	21
17134	17134	do.	July 11, 1890	Male im	204	430	155	84	12.3	8.5	17	21
17171	17171	do.	July 26, 1890	Male juv								
17172	17172	do.	do.	do								
134523	19086	Fort Clark, Kinney County, Texas	Mar. 22, 1893	Male ad	210	424	150	81	12	15.5	15.5	23
19187	19187	do.	May 9, 1893	do	206	413	148	80	11.5	14.5	15.5	23
19188	19188	do.	do	do	207	425	153	83	12	14.5	15.5	22
19189	19189	do.	do	do	209	404	145	82	11.7	15.5	15.5	22
273	273	do.	do	do	202	410	150	82	13	15.5	15.5	22
274	274	do.	do	do	208	415	148	80	12	15.5	15.5	22
134525	19087	do.	Apr. 18, 1898	Male im	203	408	150	80	11.2	15.5	15.5	21
289	14919	do.	Mar. 27, 1898	Female ad	203	408	150	80	11.2	15.5	15.5	21
14919	14919	Near Bakers Butte, Yavapai County, Arizona.	May 7, 1886	Male ad	210	420	152	86	12	9	16	22
14929	14929	do.	July 2, 1886	do	208	418	152	80	11	8	16	22
14930	14930	Near Strawberry Valley, Yavapai County, Arizona.	July 3, 1886	do	210	414	147	80	12	8	16	24
14933	14933	do.	do	do								
15407	15407	Stonemans Lake, Yavapai County, Arizona.	May 23, 1887	do	215	420	152	84	13	8	15	23
15549	15549	Bakers Butte, Yavapai County, Arizona.	July 13, 1887	do	213	433	158	82	13.7	9.5	15	21.5
15561	15561	do.	July 21, 1887	do	209	421	151	84	13.2	8.8	15	23
15562	15562	do.	do	do	202	410	146	78	13	8.4	14.5	21
15567	15567	do.	July 22, 1887	do	208	426	147	82	13	8.7	14.5	21.5
15568	15568	do.	do	do	209	415	149	80	12.6	8	15.5	21.5
15569	15569	do.	do	do	210	425	154	81	12.3	8	15.5	22.5
15630	15630	Tonto Basin, Yavapai County, Arizona.	Aug. 19, 1887	do	207	419	153	78	13	9.2	14.5	22
16373	16373	Beaver Creek, Yavapai County, Arizona.	May 19, 1888	do	209	424	156	80	10.9	8.3	17	21
14931	14931	Near Strawberry Valley, Yavapai County, Arizona.	July 8, 1886	Male juv	209	415	150	78	11	8	16	23
15631	15631	Tonto Basin, Yavapai County, Arizona.	Aug. 10, 1887	do	203	410	146	78	12	8	16.5	23
15633	15633	do.	do	do	208	426	152	80	13	8.5	17	23.5
14932	14932	do.	do	do	205	420	150	78	13	10	16	23
15408	15408	Stonemans Lake, Yavapai County, Arizona.	July 3, 1886	Female ad	203	405	148	78	12.6	8	15.5	22
15563	15563	Bakers Butte, Yavapai County, Arizona.	May 23, 1887	do	203	410	147	79	13.2	9	15.3	22
15570	15570	do.	July 21, 1887	do	198	409	147	73	12	8	15	21.5
15571	15571	do.	July 22, 1887	do	205	410	149	79	12.8	9	15	23
15572	15572	do.	do	do	205	421	149	78	13	9.1	16.5	22
15632	15632	Tonto Basin, Yavapai County, Arizona.	Aug. 10, 1887	do	199	420	150	74	13.5	9	17	23

¹ American Museum of Natural History.

² Collection of L. di Zerega Means.

RECORD AND MEASUREMENTS OF SPECIMENS OF *PROGNE SUBIS HESPERIA* Brewster.

		Laguna Mountains, coast range, San Diego County, California.	June 9, 1894	Male ad ...	200	410	150	80	11.5	15	20.5
133510.....	2711	do.....	June 16, 1894	do.....	207	423	154	86	12	14	23
133502.....	11073	do.....	June 17, 1894	do.....	206	411	148	79	12	14.8	23
133504.....	11086	do.....	June 18, 1894	do.....	211	425	151	82	12.3	14.7	25
133512.....	2806	do.....	do.....	do.....	204	420	153	80	11.2	15	23
133505.....	11087	do.....	June 21, 1894	do.....	213	430	158	78	14	15.5	22
133509.....	11130	do.....	do.....	do.....	217	419	150	84	12.8	15	23
Am. Mus.....	2827	do.....	do.....	do.....	215	422	153	83	12.5	14.5	23.5
Am. Mus.....	2828	do.....	do.....	do.....	200	430	156	77	11	16	23
Am. Mus.....	2710	do.....	June 9, 1894	Male im.....	215	424	152	83	12	15	23
133500.....	11012	do.....	do.....	do.....							
133506.....	11088	do.....	June 18, 1894	do.....							
133507.....	2814	do.....	June 19, 1894	do.....							
133825.....	11013	do.....	June 12, 1894	Female ad.....	200	407	146	72	13	16	22
133501.....	2744	do.....	do.....	do.....	200	402	147	78	11.8	15	22
133511.....	2743	do.....	June 12, 1894	do.....	205	417	149	78	12	14.7	22
Am. Mus.....	2743	do.....	do.....	do.....	203	403	144	78	12	15.8	23
Am. Mus.....	2772	do.....	do.....	do.....	205	423	154	83	12.6	15	21.5
133503.....	11074	do.....	June 14, 1894	do.....	205	423	154	81	11	15	22
Am. Mus.....	2807	do.....	June 16, 1894	do.....	197	405	147	72	10.5	14.5	20.5
133507.....	11128	do.....	June 18, 1894	do.....	195	403	145	75	12.8	15	22
133508.....	11129	do.....	June 20, 1894	do.....	203	398	143	75	12.8	15	22
	2826	do.....	June 21, 1894	do.....	217	419	150	84	12.8	15	23
		do.....	do.....	do.....							

Comparative measurements of three subspecies of *Progne subis*—Continued.RECORD AND MEASUREMENTS OF SPECIMENS OF *PROGNE SUBIS FLORIDANA* Mearns.

U. S. National Mu- seum No.	Collector's No.	Locality.	Date.	Sex and age.	Length.	Alar expanse.	Wing.	Tail.	Chord of culmen.	Bill from nostril.	Tarsus.	Middle toe with claw.
176912	12323	Lake Kissimmee, Florida	Mar. 21, 1901	Male ad	204	405	145	80	11	...	15	21
176913	12347	do.	Mar. 23, 1901	do.	210	415	152	86	12	...	14.2	21
176914	12348	do.	do.	do.	205	407	143	81	12	...	15	22
176915	12349	do.	do.	do.	211	420	149	85	12	...	15	23
176916	12350	do.	Mar. 24, 1901	do.	208	410	147	84	12.5	...	15.5	22
176917	12351	do.	Mar. 25, 1901	do.	204	417	150	82	12	...	15	22
176918	12352	do.	do.	do.	215	434	154	86	12	...	15	22
176919	12353	do.	do.	do.	207	419	152	84	12	...	15	22
176920	12354	do.	Mar. 26, 1901	do.	208	424	151	86	12.3	...	15	21.5
176921	12355	do.	do.	do.	212	425	150	86	12.5	...	15.5	21
176922	12356	do.	Mar. 30, 1901	do.	201	415	148	78	11.2	...	14.5	22
176923	12357	do.	Apr. 1, 1901	do.	208	402	145	81	12	...	15	21.5
176924	12358	do.	do.	do.	210	425	152	81	12	...	15	22
176925	12359	do.	do.	do.	211	434	155	85	12.6	...	16	22.5
176926	12401	Blue Cypress Lake, Osceola County, Florida	Apr. 15, 1901	Male im	211	430	151	84	11.3	...	15	21.5
176927	12402	Lake Kissimmee, Florida	Apr. 2, 1901	do.	203	411	146	80	12	...	17	23
176928	12403	do.	do.	Female ad.	206	412	145	79	12.2	...	17	23
176929	12361	do.	Mar. 25, 1901	do.	206	410	147	80	12	...	15	23
176930	12362	do.	Mar. 26, 1901	do.	210	422	151	82	12	...	15	22
176931	12363	do.	do.	do.	208	410	146	82	12	...	15	22.2
176932	12364	do.	Apr. 1, 1901	do.	204	407	145	80	12.3	...	15.5	22
176933	12404	do.	Apr. 2, 1901	do.	208	413	148	82	12.8	...	15.5	21.5
176934	12405	do.	do.	do.	209	410	145	83	12	...	15	22
176935	12406	do.	do.	do.	197	390	140	76	12	...	15	22
176936	12407	do.	do.	do.	207	400	141	79	12	...	15	22
176937	12408	do.	Apr. 15, 1901	do.	207	400	141	79	12	...	15	22
176938	12409	Blue Cypress Lake, Osceola County, Florida	do.	do.	207	400	141	79	12	...	15	22
176939	12452	do.	do.	do.	207	400	141	79	12	...	15	22

1 Type.

SITTA CAROLINENSIS NELSONI, new subspecies.

ROCKY MOUNTAIN NUTHATCH.

Type.—No. 131242, U.S.N.M. collection. Adult male taken October 17, 1893, in the Huachuca Mountains, Arizona, by Edgar A. Mearns. Original number, 9725.

Characters.—Largest known form of *Sitta carolinensis*. Bill large and rather stout, with contour of maxilla convex rather than straight above. Coloration dark. Under parts washed with gray and fulvous or fawn color, but less strongly so than in *Sitta carolinensis mexicana* Nelson and Palmer.¹ Measurements of type: Length, 151 mm.; alar expanse, 282; wing, 94; tail, 55; culmen (chord), 22; tarsus, 17.5; middle toe, with claw, 20.

Geographic range.—Wooded mountains of northern Chihuahua and Sonora, Arizona, New Mexico, Colorado, and northward.

Remarks.—In addition to its larger size, this form may be separated from the eastern bird by its darker coloration, the back being more nearly slate color than plumbeous, and the color pattern of the tertials as in *Sitta carolinensis aculeata*, from which latter its larger size, stouter and differently shaped bill, and the gray and fawn color instead of pure white under parts distinguish it. In *nelsoni* the white of the tail-feathers is more extended than in other forms, and, excepting *mexicana*, the fawn color of the sides and abdomen of the young is more intense than in the remaining subspecies of *Sitta carolinensis*. It is resident, in the interior, on both sides of the Mexican border. If any migration occurs in winter, the migrants are the same as the resident form, the bird of Colorado and the southern Rocky Mountain region being practically identical. Comparative measurements are given below (pp. 924-926).

¹The Auk, XI, Jan., 1894, p. 45 (Mt. Orizaba, State of Puebla, Mexico).

Record and measurements of five subspecies of *Sitta carolinensis*.

SITTA CAROLINENSIS CAROLINENSIS Latham.

U. S. National Mu- seum No.	Collector's No.	Locality.	Date.	Sex and age.	Length.	Alar expanse.	Wing.	Tail.	Culmen.	Tarsus.	Middle toe with claw.
.....	XV	Highland Falls, New York.....	Mar. 23, 1873	Male ad	152	272	.....	.....	.....	.....	.....
.....	XVI	do.....	Mar. 28, 1873	do	155	279	.....	.....	.....	.....	.....
.....	XVII	do.....	Mar. 29, 1873	do	142	262	.....	.....	.....	.....	.....
.....	227	do.....	Oct. 7, 1874	do	152	279	86	49	.....	.....	.....
.....	373	do.....	Jan. 23, 1875	do	.....	.....	.....	.....	.....	.....	.....
.....	465	do.....	Mar. 1, 1875	do	.....	.....	.....	.....	.....	.....	.....
.....	835	do.....	Dec. 16, 1875	do	149	268	89	48	.....	.....	.....
.....	849	do.....	Jan. 15, 1876	do	156	283	89	51	.....	.....	.....
.....	1583	do.....	Mar. 9, 1878	do	155	284	93	51	19	17.8	.....
.....	1768	do.....	Oct. 26, 1878	do	155	281	86	46	.....	.....	.....
.....	1807	do.....	Dec. 27, 1878	do	159	287	90	50	19.3	18.3	.....
.....	201	do.....	Dec. 21, 1882	do	253	282	93	51	19.6	19	23.4
.....	224	do.....	Oct. 7, 1874	Female ad	.....	.....	.....	.....	.....	.....	.....
.....	228	do.....	Oct. 8, 1874	do	.....	.....	.....	.....	.....	.....	.....
.....	430	do.....	Feb. 26, 1875	do	.....	.....	.....	.....	.....	.....	.....
.....	1584	do.....	Jan. 15, 1876	do	152	283	89	49	.....	.....	.....
.....	1789	do.....	Mar. 9, 1878	do	152	278	91	49	19.6	.....	.....
.....	2174	do.....	Oct. 26, 1878	do	161	284	88	50	.....	.....	.....
.....	2174	do.....	Jan. 1, 1881	do	154	274	.....	.....	.....	.....	.....
.....	2470	do.....	Dec. 1, 1882	do	152	273	88	50	18.5	18.5	21.6
153174	1514	Catskill Mountains, New York.....	Aug. 10, 1896	Male juv	.....	290	.....	.....	.....	.....	.....
.....	2150	Circleville, Ohio.....	Nov. 19, 1898	Male ad	152	290	.....	.....	.....	.....	.....
.....	11841	Lexington, Kentucky.....	Nov. 19, 1898	do	158	287	95	52	19	18	21.5
.....	6686	Fort Snelling, Minnesota.....	Mar. 5, 1890	do	.....	.....	.....	.....	.....	.....	.....
.....	7233	do.....	Oct. 23, 1890	do	.....	.....	.....	.....	.....	.....	.....
.....	7274	do.....	Feb. 6, 1891	do	.....	.....	.....	.....	.....	.....	.....
125059	6687	do.....	Mar. 5, 1890	Female ad	157	288	98	54	18.5	18	22
.....	7275	do.....	Feb. 6, 1891	do	.....	.....	.....	.....	.....	.....	.....
125060	6677	do.....	June 3, 1889	Juv	.....	.....	.....	.....	.....	.....	.....

SITTA CAROLINENSIS ATKINSI Scott.

175371	12074	Osceola County, Florida.....	Jan. 26, 1901	Female ad	149	275	90	53	19	18	21
.....	12471	Brevard County, Florida.....	Apr. 14, 1901	Male ad	158	290	94	53	20	19	21.3

SITTA CAROLINENSIS NELSONI Mearns.

2871	Prescott, Arizona.	Mar. 22, 1884	Male ad	285	91	55	20	19	21
2672	do	Nov. 25, 1884	do	150	265	55	20	19	21
3597	Near Whipple Barracks, Arizona	Dec. 17, 1884	do	160	282	95	21.5	19	22
3636	Fort Verde, Arizona.	Jan. 12, 1886	do	192	280	91	21.5	19	22
4388	do	Dec. 26, 1887	do	154	272	91	52	20	16
5886	Payson, Arizona.	Feb. 10, 1888	do	153	283	95	50	21	21
6051	do	do	do	158	282	97	54	21	19.5
6052	do	do	do	159	282	94	54	20.7	17.5
6090	do	do	do	151	280	95	55	20	18
9793	Tucson, Arizona	Feb. 18, 1888	do	150	287	90	53	18.5	20
128944	Santa Cruz River near Monument 118, Mexican boundary line.	Nov. 10, 1893	do	153	281	96	55	19	18.5
1744	Huachuca Mountains, Arizona.	July 8, 1893	Male ad	151	290	95	57	19	20.5
1855	do	Aug. 16, 1893	do	151	290	95	57	19	20.5
1915	do	Aug. 24, 1893	do	151	290	95	57	19	20.5
130696	do	Sept. 5, 1893	do	156	283	92	54	20	19
130688	do	Oct. 4, 1893	do	156	283	92	54	20	19
130692	do	Oct. 8, 1893	do	152	284	92	52	20	19
130694	do	Oct. 9, 1893	do	149	283	91	55	19	19
2104	do	July 22, 1893	do	152	290	97	55	18	21.5
2108	do	Oct. 17, 1893	do	151	282	94	55	22	17.5
9438	do	Sept. 25, 1893	do	154	290	93	53	21	21
9725	do	Ad. 4, 1892	Ad.	154	279	89	55	20.5	22
131242	San Luis Mountains, New Mexico	Jan. 20, 1896	do	154	290	95	53	20	18
9627	San Jose Mountains, Sonora, Mexico	Nov. 19, 1884	Female ad	154	281	95	53	20	18
8675	Verde Mountains, Arizona.	Nov. 12, 1887	do	151	280	93	52	20	18
4484	Near Peach Springs, Arizona.	Dec. 26, 1887	do	151	280	93	52	20	18
5726	Whipple Barracks, Arizona.	July 22, 1887	Female juv	150	279	88	50	18	17.5
5887	Fort Verde, Arizona.	do	do	152	277	93	52	19	18
5564	Bakers Butte, Arizona.	do	do	156	285	91	55	19	20.5
9437	Huachuca Mountains, Arizona.	do	do	150	279	88	50	18	17.5
1824	do	July 31, 1893	Female	152	277	93	52	19	18
130690	do	Aug. 24, 1893	do	156	285	91	55	19	20.5
130697	do	July 27, 1893	Male juv	156	285	91	55	19	20.5
1808	do	do	do	156	285	91	55	19	20.5
130693	do	do	do	156	285	91	55	19	20.5
130698	do	do	do	156	285	91	55	19	20.5

SITTA CAROLINENSIS ACULEATA (Cassin).

11032	Laguna Mountains, San Diego County, California.	June 13, 1894	Male ad	151	272	90	52	20	17
11034	do	do	do	153	280	93	51	20	18
11035	do	do	do	148	267	89	50	19	18
11036	do	do	do	153	279	90	52	20	17
11078	do	June 14, 1894	do	146	267	86	48	19	17
11079	do	June 16, 1894	do	153	279	91	54	20	18
11080	do	do	do	146	267	86	48	19	17
11081	do	do	do	151	276	91	54	20	18
11082	do	June 11, 1894	do	151	276	91	54	20	18
11083	do	June 14, 1894	do	147	268	87	50	19	17
11084	do	June 16, 1894	do	154	280	92	55	20	18
11085	do	June 18, 1894	do	150	271	88	51	20	18
11086	do	do	do	151	271	88	51	20	18
11087	do	do	do	153	280	93	52	20	18
11088	do	do	do	148	267	89	51	20	18
11089	do	do	do	153	279	90	52	20	17
11090	do	do	do	146	267	86	48	19	17
11091	do	do	do	151	276	91	54	20	18
11092	do	do	do	147	268	87	50	19	17
11093	do	do	do	154	280	92	55	20	18
11094	do	do	do	150	271	88	51	20	18
11095	do	do	do	151	271	88	51	20	18
11096	do	do	do	153	280	93	52	20	18
11097	do	do	do	148	267	89	51	20	18
11098	do	do	do	153	279	90	52	20	17
11099	do	do	do	146	267	86	48	19	17
11100	do	do	do	151	276	91	54	20	18
11101	do	do	do	147	268	87	50	19	17
11102	do	do	do	154	280	92	55	20	18
11103	do	do	do	150	271	88	51	20	18
11104	do	do	do	151	271	88	51	20	18
11105	do	do	do	153	280	93	52	20	18
11106	do	do	do	148	267	89	51	20	18
11107	do	do	do	153	279	90	52	20	17
11108	do	do	do	146	267	86	48	19	17
11109	do	do	do	151	276	91	54	20	18
11110	do	do	do	147	268	87	50	19	17
11111	do	do	do	154	280	92	55	20	18
11112	do	do	do	150	271	88	51	20	18
11113	do	do	do	151	271	88	51	20	18
11114	do	do	do	153	280	93	52	20	18
11115	do	do	do	148	267	89	51	20	18
11116	do	do	do	153	279	90	52	20	17
11117	do	do	do	146	267	86	48	19	17
11118	do	do	do	151	276	91	54	20	18
11119	do	do	do	147	268	87	50	19	17
11120	do	do	do	154	280	92	55	20	18
11121	do	do	do	150	271	88	51	20	18
11122	do	do	do	151	271	88	51	20	18
11123	do	do	do	153	280	93	52	20	18
11124	do	do	do	148	267	89	51	20	18
11125	do	do	do	153	279	90	52	20	17
11126	do	do	do	146	267	86	48	19	17
11127	do	do	do	151	276	91	54	20	18
11128	do	do	do	147	268	87	50	19	17
11129	do	do	do	154	280	92	55	20	18
11130	do	do	do	150	271	88	51	20	18
11131	do	do	do	151	271	88	51	20	18
11132	do	do	do	153	280	93	52	20	18
11133	do	do	do	148	267	89	51	20	18
11134	do	do	do	153	279	90	52	20	17
11135	do	do	do	146	267	86	48	19	17
11136	do	do	do	151	276	91	54	20	18
11137	do	do	do	147	268	87	50	19	17
11138	do	do	do	154	280	92	55	20	18
11139	do	do	do	150	271	88	51	20	18
11140	do	do	do	151	271	88	51	20	18
11141	do	do	do	153	280	93	52	20	18
11142	do	do	do	148	267	89	51	20	18
11143	do	do	do	153	279	90	52	20	17
11144	do	do	do	146	267	86	48	19	17
11145	do	do	do	151	276	91	54	20	18
11146	do	do	do	147	268	87	50	19	17
11147	do	do	do	154	280	92	55	20	18
11148	do	do	do	150	271	88	51	20	18
11149	do	do	do	151	271	88	51	20	18
11150	do	do	do	153	280	93	52	20	18
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11163	do	do	do	151	276	91	54	20	18
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11180	do	do	do	146	267	86	48	19	17
11181	do	do	do	151	276	91	54	20	18
11182	do	do	do	147	268	87	50	19	17
11183	do	do	do	154	280	92	55	20	18
11184	do	do	do	150	271	88	51	20	18
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11203	do	do	do	151	271	88	51	20	18
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11208	do	do	do	151	276	91	54	20	18
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11211	do	do	do	150	271	88	51	20	18
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11225	do	do	do	146	267	86	48	19	17
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11227	do	do	do	147	268	87	50	19	17
11228	do	do	do	154	280	92	55	20	18
11229	do	do	do	150	271	88	51	20	18
11230	do	do	do	151	271	88	51	20	18
11231	do	do	do	153	280	93	52	20	18
11232	do	do	do	148	267	89	51	20	18
11233	do	do	do	153	279	90	52	20	17
11234	do	do	do	146	267	86	48	19	17
11235	do	do	do	151	276	91	54	20	18

1 Type.

² First plumage.

Record and measurements of five subspecies of *Sitta carolinensis*—Continued.

SITTA CAROLINENSIS ACULEATA (Cassin)—Continued.

U. S. National Museum No.	Collector's No.	Locality.	Date.	Sex and age.	Length.	Alar expanse.	Wing.	Tail.	Culmen.	Tarsus.	Middle toe with claw.
134190.....	11299	Pine Valley, San Diego County, California ¹	Aug. 10, 1894	Male ad.	146	262	87	47	19.5	17	20
11033.....	11033	Laguna Mountains, San Diego County, California.	June 13, 1894	Female ad.	150	269	88	51	20	17.5	20
11079.....	11079	do	do	do	150	273	91	50	20	17.7	21.2
2768.....	2768	do	June 16, 1894	do	151	273	91	51	20	18	20.5
133421.....	11137	do	June 14, 1894	do	147	276	91	48	16.5	18	21
133422.....	11138	do	June 21, 1894	Female juv	147	276	91	48	16.5	18	21
133807.....	2824	do	do	do	.....	.....	.....	.....	.....	.....	.....
2731.....	2731	do	June 11, 1894	Male juv	.....	.....	.....	.....	.....	.....	.....
133424.....	2793	do	June 16, 1894	do	.....	.....	.....	.....	.....	.....	.....
134189.....	11051	do	June 14, 1894	do	.....	.....	.....	.....	.....	.....	.....

SITTA CAROLINENSIS MEXICANA Nelson.

Measurements taken from original description	89	19.3	219
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¹ Molting badly.² Bill from nostril, 13.

INDEX.

	Page.		Page.
Abbotornis	664	Actinotrophon	534, 541
Abeltera	664	Actiornis	664
Abelterus	664	anglicus	664
Abeona	354	Actitis macularia	165
Aboma	35, 67, 96, 130	Actophilus	664, 706
breunigi	67, 71, 130	Acus rushii	503
etheostoma	67	Adelomyia maculata	332
heptacantha	67, 70, 130	melanogenys	332, 334
lactipes	67, 130	maculata	332
tsushima	67, 69, 130	melanogenys	332
urotænia	71, 130	Adelonetta	665
Abudeuf	606, 607	Adelpha barnesia, new species	396
sexfasciatus	608	erotia	396
sordidus	606, 607	goyama, new species	395
Abudjubbe	607	plexaure	397
lunulatus	607	Admete	504
Abuhamrur	607	microscopica	504, 563
hamrur	607	middendorffiana	516
Abura uwo	599	Adult	578
Acanthogobius	36, 96, 98, 100, 102, 131	Ægialodes	665
flavimanus	98, 131	Ægialornis	665
Acantholepis	590	gallicus	665
silus	590	Ægialornithidæ	722
Acanthopteri	361	Ægithalus	712
Acanthosoma	260	Æpyornithidæ	722
carinatum	260, 261	Ærocharis	665
Acanthuridæ	606	Æronautes	665
Acanthurus	606, 607	Æthiopsar	665
Acentrogobius chlorostigma	54	Æthopyga christinae	720
gymnauchen	58	Aforia circinata	515
pflaumi	65	Afrotis	675
Acentronura	6, 12, 20	Agama superciliosa	182
gracilissima	12, 20	Agamia	679
gracillima	12	Aglæactis cupripennis	328
Acestrura	341	æquatorialis	328
Acmonorhynchus	664	var. æquatorialis	328
Acraea dognini, new species	391	Aglaia cyanocephala	687
mamita	391	Aglaiaæctis æquatorialis	328
mitama, new species	391	Agriocharis	665
ozinta, new species	391	Agriopoma new section	509
quadra, new species	392	texasiana	509, 564
surima, new species	392	Agropsar	665
Acraëna	391	Agyrtia	316
Acridothères	665	amabilis	316
Acrilla retifera	506, 563	fluvialis	316
Actæon	512	viridiceps	316
breviculus, new species	512	Aimophila pulchra	690
cortulus	512	superciliosa	707
perconicus	512	Ainosus, new genus	109, 132
Actæonidæ	512	geneionemus	109, 132
Actia	664	Ajaja	698
Actinochir	348	Akabera	637
major	348	Aka-gisu	468

	Page.		Page.
Akagutsu.....	380	Amblypomacentrus breviceps.....	600
Akamebuku.....	255	Ameghinia.....	667, 709
Akatanago.....	357, 359	Ameiva ameiva.....	183
Akatora-haze.....	468	Amemasu.....	582
Ala blanca.....	325	Amenouwo.....	582
hueso.....	315	American Butterflies, Descriptions of New, by William Schaus.....	383
Alauda albigula.....	872	American Moths of the Genus Depressaria Haworth, a Review of the, with Descrip- tions of New Species, by August Busck.....	731
alpestris.....	807, 808, 809	Amizilis dumerili.....	317
bicornis.....	879	dumerilii.....	317
bilopha.....	873, 879	feliciæ.....	173
chrysolæma.....	842, 843	tzacatl jucunda.....	317
cornuta.....	805, 807, 809	Ammodramus australis.....	916
duponti.....	673	Amnicola.....	275, 667
flava.....	810, 811	attenuate.....	276
glacialis.....	844	granum.....	286
gutturæ flavo.....	808	longinqua.....	279, 284, 287
minor.....	842, 844	micrococcus.....	287
nivalis.....	810, 812	protea.....	276, 277
penicillata.....	874	Amnicolidæ.....	284
rufa.....	845, 848	Ampelis carnifex.....	672
Alaudidæ.....	722	Amphæces.....	628
Alca.....	133	geographicus.....	628
Alcatras.....	665	Amphipelargus.....	667
Alcatraz.....	665	majori.....	667
Alcedinidæ.....	170	Amphiprion.....	596, 660
Alcidæ.....	722	bicinctus.....	598
Alcidius.....	665	boholensis.....	598
Alcimosphenus lacinus.....	220	chrysargurus.....	598
Alector.....	665	chrysopterus.....	598
Alectromorphnus.....	666	clarkii.....	598
Aledon.....	260	ephippium.....	596
capensis.....	261	frenatus.....	596, 597, 598, 660
mola.....	260	japonicus.....	598
storeri.....	260, 261	macrostomus.....	597, 598
Algæ of the Genus Buthotrephis, Two New Species of, from the Upper Silurian of Indiana, by David White.....	265	milii.....	598
Allenia.....	666	polymnus.....	596, 598, 660
Allocotops.....	666	tricolor.....	597
calvus.....	666	xanthurus.....	598
Alopecænas.....	666	Amydrus tristrami.....	686
Alophoixus.....	666	Amytis.....	667, 678
Alopoche.....	666	Amytornis.....	667, 678
Alticeps.....	666	Anachis.....	532, 533
Amadai.....	489	Anacrites.....	667
Amæa mitchelli.....	506, 563	Anampses.....	613, 628, 661
Amalocichla.....	666	cuvieri.....	628
sclateriana.....	666	geographicus.....	628, 661
Amasagi.....	588	tetrodon.....	628
Amaurocichla.....	666	Anaplocamus borealis.....	550, 565
bocagii.....	666	Anas chlorotis.....	681
Amauroænas.....	666	lobata.....	688
Amaurolimnas.....	666	malacorhynchus.....	694
Amauropsis islandicus.....	552	poecilorhyncha.....	707
purpurea.....	551, 552, 565	scutulata.....	669
Amazilia.....	666	Anatidæ.....	722
tzacatl jucunda.....	317	Anchisomus.....	232
Amazona.....	169	spengleri.....	232
Amblyonyx.....	668	Ancistrolepis.....	523
Amblychæturichthys hexanemus.....	104	Ancyropus.....	663
Amblyglyphidodon.....	607	Andaman and Nicobar Islands, the Mam- mals of the, by Gerrit S. Miller, jr.....	751
aureus.....	607	Andropadus gracilirostris.....	716
Amblyopus hermannianus.....	128	virens.....	683
lacepedei.....	128	Androphilus.....	667
Amblyornis subalaris.....	721	accentor.....	667
Amblypomacentrus.....	600		

	Page.		Page.
<i>Anema elongatum</i>	478	<i>Aphanapteryx hawkinsi</i>	678
<i>Anemasu</i>	577	<i>Aphanolimnas</i>	668, 691
<i>Angel quinde</i>	340	<i>Aphelocephala</i>	668
<i>Angler-fishes</i>	361	<i>Aphrastura</i>	668
<i>Anglers, the</i>	362	<i>Aplexa aurantia</i>	288
<i>Anisochosia subpicta</i> , new species	431	<i>hypnorum</i>	289
<i>Anisolornis</i>	667	<i>Apocryptes cantonensis</i>	49
<i>excavatus</i>	667	<i>chinensis</i>	47
<i>Anko</i>	366	<i>pectinirostris</i>	47
Annotated List of Batrachians and Rep- tiles Collected in the Vicinity of La Guaira, Venezuela, with Descriptions of Two New Species of Snakes, an, by Leonhard Stejneger	179	<i>Apodemia multiplaga</i> , new species	404
Annotated List of Birds Collected in the Vicinity of La Guaira, Venezuela, an, by Wirt Robinson and Charles W. Rich- mond	163	<i>Apsicephalus</i>	232
Annotated List of Mammals Collected in the Vicinity of La Guaira, Venezuela, an, by Wirt Robinson and Marcus W. Lyon, jr	135	<i>testudineus</i>	232
<i>Annual fish</i>	584	<i>Apterygida</i>	722
<i>Anodonta</i>	287	<i>Ara</i>	169, 668
<i>californiensis</i>	287	<i>Arachnida</i> from Porto Rico, Some Spiders and Other, by Nathan Banks	217
<i>Anoka vernalis</i>	224	<i>Araclanga</i>	668
<i>Anolis chrysoplepis</i>	182	<i>Aramidopsis</i>	668
<i>Anomalophrys</i>	667	<i>Aranea argentata</i>	221
<i>Anomalopteryx</i>	667	<i>mactans</i>	219
<i>Anopaia</i>	667	<i>tetracantha</i>	222
<i>Anosmius</i>	254	<i>venatoria</i>	223
<i>tæniatus</i>	254	<i>Araneida</i>	217
<i>Anser sandvicensis</i>	699	<i>Araneus fastuosus</i>	221
<i>Antennariidae</i>	362, 367, 381	<i>geniculatus</i>	219
<i>Antennarius</i>	367, 371, 381	<i>Arborophila</i>	677
<i>marmoratus</i>	368	<i>Arca</i>	508
var. <i>raninus</i>	369	<i>adamsi</i> var. <i>conradiana</i>	508, 563
<i>nitidus</i>	369	<i>saginata</i>	508, 563
<i>nox</i> , new species	372, 374, 375, 381	<i>Archæopteryges</i>	722
<i>sanguifluus</i> , new species	372, 374, 381	<i>Archæopteryx</i>	686
<i>scaber</i>	371	<i>Archæotrogon</i>	668
<i>scriptissimus</i> , new species	372	<i>venustus</i>	668
.....	373, 381	<i>Arctoscopus</i>	482, 484, 497
<i>tridens</i>	372, 373, 375, 376, 381	<i>japonicus</i>	484, 497
<i>Anthias clarkii</i>	598	<i>Ardea americana</i>	692
<i>Anthracosceros marchii</i>	686	<i>ardesiaca</i>	695
<i>Anthracothonax violicaudus</i>	321	<i>calceolata</i>	695
<i>iridescens</i>	321	<i>candidissima</i>	692
<i>Anthus rufus</i>	848	<i>cyancephala</i>	715
<i>trivialis</i>	844	<i>flavicollis</i>	721
<i>Antichromus</i>	667, 670	<i>intermedia</i>	695
<i>Antiplanes</i>	513	<i>novæ-hollandiæ</i>	699
<i>perversa</i>	513, 564	<i>nycticorax</i>	700
<i>piona</i> , new species	514	<i>rufa</i>	688
<i>santarosana</i> , new species	515	<i>rufiventris</i>	682
<i>thalæa</i> , new species	514	<i>Ardeidae</i>	164, 722, 723
<i>vinosa</i>	514, 564	<i>Ardeiralla</i>	680
<i>Antistreptus</i> , new genus	532	<i>woodfordi</i>	682
<i>magellanicus</i> , new species	532	<i>Areortyx</i>	668
<i>Antrochelidon</i>	667	<i>Areoturnix</i>	668
<i>Antrostomus rufus</i>	171	<i>Argentina</i>	586, 590, 593
<i>Anurolimnas</i>	667	<i>kagoshimæ</i> , new species	590, 593
<i>Anyphæna tenuis</i>	218	<i>sphyræna</i>	590
<i>Aobera</i>	637	<i>Argentinidae</i>	567, 586, 593
<i>Aobudai</i>	659	<i>Argillornis</i>	669
<i>Aogisu</i>	487	<i>longipennis</i>	668
		<i>Argiope argentata</i>	221
		<i>fastuosa</i>	221
		<i>transversa</i>	221
		<i>Argiopes fenestrinus</i>	221
		<i>Argonauta expansa</i>	511, 564
		<i>Argozoom</i>	663
		<i>Argyropeira argyra</i>	220
		<i>bigibbosa</i>	220
		<i>Arimia</i>	668
		<i>boucardi</i>	668

	Page.		Page.
Ariscopus, new genus	474, 479, 497	Austrotrophon	584, 548
iburius, new species	479, 497	Avicularia	217
Arothron	249	læta	217
laterna	252	Axiidae	886
lineatus	250	Axius spinulicauda, new species	886
ophryas	253	Ayresia	599
reticularis	249	punctipinnis	599
testudinarius	249	Aysha tenuis	218
Arquata	668	Ayu	584
Arquatella	664	Babirussa	754
Arremonops	668	Badiostes	669
venezuelensis	175	patagonicus	669
Artamida	723	Bacotis bacænis	403
Artema atlanta	219	bacanita, new species	402
Artibeus palmarum	148	Baillonius	712
planirostris	148	Baione	581
quadrivittatus	150	fontinalis	581
Asarcia	668	Bamboo leaf	625
Asarcornis	669	Banks, Nathan, on Some Spiders and Other Arachnida from Porto Rico	217
Ascalaphia	669	Barornis	669
savignii	669	regens	669
Ashmunella ashmuni	501, 563	Basileuterus flaveolus	177
pseudodonta	500, 563	Bat fishes	377
rhyssa	500, 563	Bathmisyrra	669
Aspatha	669	rufum	669
Astarte globula	508, 564	Bathmocercus	669
smithii var. globula	508	rufus	669
Asteropteryx	35, 40, 129	Bathypercis	469
abax, new species	40, 129	platyrhynchus	469
semipunctatus	40	Batrachia	179
Asthenopterus	669, 691	Batrachians and Reptiles Collected in the Vicinity of La Guaira, Venezuela, with Descriptions of Two New Species of Snakes, an Annotated List of, by Leon- hard Stejneger	179
Asthenotherus hemphilli	510, 564	Batrachoididae	361, 461
Astrabe, new genus	37, 119, 132	Batrachopus	663
lactisella, new species	119, 132	Batrachus mollis	368
Astrapia splendidissima	671	Beauharnesius	720
Astyris aurantiaca	531, 564	Behringiana	531
Atalochrous	669	Bellona	669
Atherina	199, 200	Belornis	669, 717
bleekeri	200, 201, 203	Bembrops	469, 470, 496
hepsetus	200	caudimacula	469, 470, 496
japonica	201	Beni kusabé	654
pinguis	200	Benimasu	575, 577
sihama	486	Bera	623, 625
tsurugæ, new species	202	Beringius	520, 524, 529, 530
valenciennesi	201	crebricostatus	530, 564
woodwardi, new species	200	kennicottii	523, 530, 564
Atherinichthys	201	Bibliography of fossil shells	297
Atherinidae	199, 205	Birds Collected in the Vicinity of La Guaira, Venezuela, an Annotated List of, by Wirt Robinson and Charles W. Richmond	163
Atherion, new genus	199, 203	from the Southern United States, Descriptions of Three New, by Edgar A. Mearns	915
elymus, new species	203	List of Generic Terms Proposed for, During the Years 1890 to 1900, Inclusive, to which are Added Names Omitted by Waterhouse in his "Index Generum Avium," by Charles W. Richmond	663
Atopornis	669	Blacops	670
diabolicus	669	Blax	670
Atractus	520, 521		
Atrytone brasina, new species	436		
paranensis, new species	436		
urqua, new species	436		
Atticora cyanoleuca	177		
Attidae	224		
Attus ligo	224		
paykulli	224		
Augiades aligula, new species	438		
anita, new species	437		
chalcone, new species	437		
tania, new species	438		
turbis, new species	438		
Aulacorhampus erythrognathus	170		
Aurinia dubia	504, 563		

	Page.		Page.
<i>Blax gymnophthalmus</i>	670	<i>Boreotrophon orpheus</i>	542
<i>Bleda</i>	670	<i>pacificus</i> , new species.....	544
<i>Blennioid</i>	461	<i>panamensis</i> , new species..	546
<i>Blennioidea</i>	461	<i>peregrinus</i> , new species...	543
<i>Blue back</i>	575	<i>richardi</i>	539
<i>bera</i>	637	<i>rotundatus</i> , new species...	547
<i>kisugo</i>	487	<i>scalariformis</i>	537, 540, 544
<i>scarus</i>	659	<i>scitulus</i>	541, 545
<i>Boa</i>	184, 185	<i>smithi</i> , new species.....	542
<i>canina</i>	185	<i>stuarti</i>	542, 543
<i>constrictor</i>	185	<i>tenuisculptus</i>	541
<i>divinoquus</i>	185	<i>triangulatus</i>	549
<i>orophias</i>	185	<i>tripherus</i> , new species.....	545
<i>ruschenbergii</i>	184	<i>truncatus</i>	537, 539, 544
<i>Bocagia</i>	667, 670	<i>varicosissimus</i>	539
<i>Bodianina</i>	612	<i>Bostrycholophus</i>	670, 672
<i>Boissonneaua flavescens</i>	329	<i>Bourcieria fulgidigula</i>	326
<i>tinoclora</i> , new		<i>torquatus</i>	325
subspecies.....	329	<i>Rowdleria</i>	670
<i>jardinei</i>	328	<i>Brachiopoda</i>	561
<i>jardini</i>	328	<i>Brachonyx</i>	805
<i>matthewsi</i>	328	<i>Brachycephalus</i>	249
<i>Boissonneauxia jardinei</i>	328	<i>Brachycope</i>	670
<i>Bolbopsittacus</i>	670	<i>anomala</i>	670
<i>Boleophthalmus</i>	35, 47, 130	<i>Brachypomacentrus</i>	600
<i>boddarti</i>	47, 48	<i>albifasciatus</i>	600
<i>chinensis</i>	47, 130	<i>Brachypteryx</i>	670
<i>pectinirostris</i>	48	<i>atriceps</i>	713
<i>Boleops aucupatorius</i>	47	<i>Brachypus</i>	670, 681
<i>Bollmannia</i>	51	<i>leucogenys</i>	672
<i>Bonapartia</i>	670, 686	<i>tygus</i>	686
<i>Boreofusus</i>	524	<i>Brachyramphus hypoleucus</i>	696
<i>Boreotrophon</i>	499, 533,	<i>Brachyrhynchus</i>	670
534, 535, 536, 537, 542, 543, 546, 547, 550		<i>Brachyspiza</i>	671
<i>abyssorum</i>	540	<i>Brachyurus steerii</i>	676
<i>actinophorus</i>	541	<i>Brassolina</i>	390
<i>aculeatus</i> var <i>lacunella</i>	540	<i>Brewsteria</i>	671
<i>alaskanus</i> , new species.....	545	<i>Broad perch</i>	654
<i>altus</i>	548	<i>Brocade-fish</i>	646
<i>avalonensis</i> , new species..	546, 547	<i>Brontornis</i>	671
<i>barvicensis</i>	538, 539	<i>burmeisteri</i>	671
<i>beringi</i> , new species.....	544	<i>Brontozoum</i>	663
<i>carinatus</i>	539	<i>Buarremon crassirostris</i>	694
<i>cepul</i>	547	<i>Bubonidae</i>	169, 723
var. <i>cymatus</i>	547	<i>Buccanodon</i>	707
<i>clathratus</i> .. 537, 538, 540, 543, 544, 546		<i>Buccinidae</i>	517, 524, 531
<i>clathrus</i>	521	<i>Buccininae</i>	499, 517, 524
<i>clavatus</i>	539	<i>Buccinopsis</i>	530
<i>cossmanni</i>	539	<i>canaliculata</i>	531
<i>craticulatus</i>	538, 540	<i>nux</i>	530
<i>cymatus</i>	548	<i>Buccinum</i>	522
<i>dabneyi</i>	539	<i>angulosum</i>	517, 518, 519, 565
<i>dalli</i>	547, 548	<i>angulosum</i> var. <i>normale</i>	518, 565
<i>decoratus</i>	539	<i>angulosum</i> var. <i>subcostatum</i> ..	518, 565
<i>deversus</i>	539	<i>castaneum</i>	518, 519, 565
<i>disparilis</i>	545, 546	<i>castaneum</i> var. <i>tricarinatum</i> ..	519, 565
<i>droueti</i>	539	<i>dalei</i>	524
<i>eucymatus</i>	547	<i>finmarkianum</i>	520
<i>grimaldii</i>	539	<i>hirasei</i>	524
<i>gunneri</i>	537, 539, 543	<i>hydrophanum</i>	518
<i>kamchatkanus</i> , new species	541	<i>kennicottii</i>	530
<i>limicola</i>	540	<i>ochotense</i>	518
<i>maclaini</i> , new species.....	538	<i>ovoides</i>	531
<i>mazatlanicus</i> , new species..	546	<i>percrassum</i>	518, 565
<i>multicostatus</i>	543	<i>picturatum</i>	520, 565
<i>multilamellosus</i>	539	<i>plectrum</i>	519, 565
<i>muricatus</i>	539	<i>polare</i>	518

	Page.		Page.
Buccinum schrenckii	518	Callianassa goniophthalma, new species.....	886
stimpsoni	517, 518	Callianassidæ.....	886
taphrium	524	Callimormus diaeses, new species.....	456
tenellum	519, 565	verames, new species	456
truncatum	537	Calliodon.....	657, 658
Bucco bidentatus.....	694	croicensis.....	658
duvauceli	696	lineatus	658
hayi	711	Calliostoma iridium.....	552, 565
zeylonicus.....	718	turbium	552, 565
Buceros albocristatus.....	701	variegatum	552, 565
cassidix	672	Calliphlox mitchelli	341
exaratus	712	mitchellii	341
tickelli	711	Callista	509
Bucerotidæ.....	723	Callioleria tosea, new species	386
Budai	657	Callornis	671
Bufo marinus	180	giganteus.....	671
Buleites	671	Callyodon.....	656, 658
Bullfrog from Florida and the Gulf Coast, a New Species of, by Leonhard Stejne- ger	211	croicensis.....	658
Burr-fishes.....	258	japonicus.....	657
Busck, August, on A Review of the Ameri- can Moths of the Genus Depressaria Haworth, with Descriptions of New Species	731	lineatus	658
Buteo abbreviatus.....	167	rubiginosus.....	657
Buteogallus	666	Calobamon	671
Buteonidæ.....	167	Calodromas	671
Buthotrephis	265, 267, 268, 269, 270	Calopelia	671
antigua	267	Calopezus	671
divaricata, new species.....	265,	Calopus.....	663
266, 267, 270		Calornis corvina.....	690
gracilis	267	Calothorax micurus.....	340
impudica	267	Galotomus.....	656, 662
lesquereuxii.....	265, 266, 267, 268	japonicus	655, 662
newlini, new species	265,	xenodon.....	656
266, 267, 268, 269, 270		Caluromys philander.....	138
subnodosa	267	Calvifrons	671, 705
succulens.....	267	Calydna zea, new species.....	403
Two New Species of Algae of the Genus, from the Upper Silurian of Indiana, by David White	265	Calzones blancos	330
Butleria arpia, new species	435	negros	331
Butterflies, Descriptions of New Ameri- can, by William Schaus	383	Camaskelus	672
Bythinella	275, 276, 277, 282	palustris	672
intermedia	285	Campephagidæ.....	723
protea	277	Campephilus malherbli	171
seemani	277	Campylopterus lazulus	315
Cabassous	161	obscurus	315
hispidus	139	villavicencio.....	315
lugubris	139	villaviscensio	315
Cacatuidæ.....	723	Cancellaria microscopica.....	504
Cacomitl Cat of the Rio Grande Valley, the, by Edgar A. Mearns.....	207	middendorffiana.....	516, 565
Caica	706	Cancer spinus	893
Calamodromus	671	Canis cancrivorus	146
Calastacus felix	887	Canthigaster	254
quinqueseriatus, new species.....	887	Canzacotas	323
Calastrapia	671	Capito goffini	719
Calendula fremantlii.....	709	Capitonidæ.....	723
Calico salmon	572	Caprimulgidæ.....	171, 723
Callaeops	671	Capornis.....	672
periophthalmica	671	Carbo bougainvillii	692
Calleleotris strigata	42	Careliparis	348
Callianassa cæcigena.....	886	agassizi	348
		Careproctus	348
		Caria tabrenthia, new species.....	403
		Carinifex newberryi.....	293
		Carnifex	672
		Carollia brevicauda	152
		Carpenteria	303
		Carpophaga	676, 677, 722
		forsteri	722
		pæcilorrhœa	676
		Casarca	699

	Page.		Page.
Cassidix	672	Chætodon sordidus	610
Cassinia	717	tyrwhitti	608
Castanolimnas	672	Chætodontidae	596, 606
Casuariidae	723	Chæturichthys	37, 104, 132
Cat of the Rio Grande Valley, the Caco-		hexanemus... 105, 106, 107, 108, 132	
mitl, by Edgar A. Mearns	207	polynema	103
Catalogue of a Collection of Humming-		sciistius, new species . 105, 107, 132	
birds from Ecuador and Colombia, by		stigmatias	104, 105, 132
Harry C. Oberholser	309	Chalcophaps	677
Cataphania	672	Chalcopsar	673
Cataponera	672	Chalcostigma herrani	335
turdoides	672	stanleyi	335
Catharista urubu	167	Chalmon	535
Cathartes aura	167	Chama lactuca	509, 564
Cathartidae	167, 723	nicolloni	509
Catherpes sumichrasti	689	Chamaelimnas joviana, new species.	401, 402
Catia druryi	446	similis, new species	402
minaya, new species	446	Chamberlin, Ralph V., on Henicops Doli-	
Catophrynychus	232	chopus, a New Chilopod from Utah	797
lampris	232	Chamberlin, Ralph V., on List of the Myri-	
Cecropis	687	apod Family Lithobiidae of Salt Lake	
Cecropterus evelinda	429	County, Utah, with Descriptions of Five	
ochrilinea, new species	429	New Species	21
Centaurus	260	Champsodon	480, 497
boops	260	vorax	480, 481, 497
Centrolophus	670, 672	Champsodontidae	462, 480, 497
Centropus antiquus	676	Charadriidae	723
Centronis	672	Charadrius ægyptius	720
majori	672	leucurus	683
Centurus insulanus	225	tricolor	722
Cephallepis	716	Charis dukinfieldia, new species	401
Cephalopoda	511	incoides, new species	401
Cephalopterus	666	Charrs	581
Cephalus	260	Chasmias	36, 84, 100, 131
brevis	261	dollichognathus	84, 131
mola	260	misakius	84, 85, 86, 131
orthagoriscus	261	Chaunax	367, 376, 381
pallasianus	261	fimbriatus	377, 381
Cephus columba	710	pictus	376, 377
Cerasophila	672	Chauvard	671
thompsoni	672	Cheilichthys	232
Ceratitis lycii, new species	30	testudineus	232
rubivora, new species	29	Cheilinoidea	651
Cercocobus carbonarius	789, 795	cyanopleura	651
Ceres nelsoni	501, 563	Cheilinus	613, 653, 662
Cereus	136	blochi	635
Certhia cinnamomea	672	lunulatus	607
cyanea	676	oxyrhynchus	653, 654, 662
Certiaxis	672	trilobatus	653
Cervus axis	793	Cheilio	613, 643, 662
Ceryle americana	170	auratus	643, 644
Cetoconcha elongata	561	bicolor	644
scapha, new species	561	cyanochloris	644
Cetupa	673	forskalii	644
Chænogobius	36, 74, 75, 76, 78, 131	fuscus	644
annularis	75, 76, 131	hemichrysos	644
macrogathos	76, 131	inermis	644, 662
Chaetocercus	341	microstoma	644
bombus	341	ramosus	644
jourdani	341	viridis	644
mulsanti	341	Cheilodipterus cilius	45
Chætodon	606	Chelidonaria	673
cauda bifurca	608	Chema	673
curaçao	610	Chenalopex	666
rotundatus cinereas	608	Chenornis	673
rotundus	608	graculoides	673
saxatilis	608	Chera	678

	Page.		Page.
Chersophilus	673	Chondrodonta glabra, new species.....	302, 303, 306, 307
Chiasmodontidae	462, 480	joannæ	303
Chidai.....	654	munsoni.....	303, 305, 306, 307
Chika.....	588, 589	Chondrohierax	169
Chilomycterus.....	256, 258, 264	rufifrons	169
antennatus	258	uncinatus	169
atinga	259	Chordeiles pusillus.....	698
californiensis	258, 259, 264	Chosornis	673
reticulatus.....	258, 259	præteritus	673
tigrinus.....	258	Chotorea	685
Chilopod, a New, from Utah, Henicops Dol-		Chriasonodon	480
ichopus, by Ralph V. Chamberlin	797	Chromis	596, 599, 660
Chinese bera	623	chromis	599
Chinnook salmon	570	notatus.....	599, 660
Chiomara marthona, new species	435	Chrysiptera	596, 605, 661
Chiquera	719	azureus	605
Chiracanthium inclussum.....	219	bonang	605, 606, 661
viride	219	brownriggi	606
Chironectes	161, 371	zonatus.....	606
(antennarius)	371	melas.....	605, 661
marmoratus	368	Chrysodomi	536
tridens	372	Chrysodominae	499, 520
Chiroxiphia lanceolata	173	Chrysodomus	520, 521, 522, 523, 536
Chloea	36, 78, 131	antiquus	521, 522
castanea	78, 79, 131	brunneus	525
lævis.....	79, 80, 131	contrarius.....	521
mororana, new species	79, 80, 83, 131	crebricostatus	524, 529, 530
sarchynnis, new species	79, 82, 131	despectus	536
Chlorichthys	645	eucosmius.....	523
bifasciatus	645	fuscoligatus	525
Chlorippe laure	397	islandicus	521
laurona, new species	397	kennicottii	524, 530
Chlorocharis	673	liratus.....	518
emiliæ.....	673	martensi	526
Chlorodrepanis	673	pericochlion	524
Chloronerpes rubiginosus	171	rectirostris	525
Chlorophanes spiza	176	roseus	526
Chlorophyceæ	269	tabulatus	524, 564
Chlorostilbon caribbæa	173	virens	525
daphne	318	Chrysolampis moschitus.....	172
melanorhynchus	318	Chrysomitridops	673
prasinus daphne	318	cæruleirostris.....	673
pumilus	318	Chrysoptera	605
stenura.....	318	Chrysouronia cenone	317
stenurus.....	318	cenone.....	317
Chlorurus	658	Cichlidæ	596
gibbus	658	Cichlops	490, 491, 497
Chærojulis	636	cyclophthalma	491, 497
Chærops.....	612, 614, 661	cyclophthalmus	491
anchorago.....	614, 616, 661	japonica	491
azurio	614, 661	japonicus.....	491
japonicus	614	Ciconiidae	723
macrodon	614	Cimolopteryx	673
macrodonta	616	rarus	673
meleagris.....	614	Cinco reales	332
Choirodon	614	Ciridops	673
macrodon	614	Cirrhilabrus	613, 651, 662
Chondrites	270	temmincki	651, 662
dolichophyllus	270	Cirrhisomus	232
Chondrodonta, a New Genus of Ostrei-		spengleri	232
form Mollusks from the		Cirsotrema cochlea.....	506, 563
Cretaceous, with De-		Cirulus	673
scriptions of the Geno-		pratensis	673
type and a New Spe-		Cladobates nicobaricus.....	773, 795
cies, by Timothy W.		Cladornis	673
Stanton	301	pachypus.....	673
new genus... 301, 302, 303, 304, 305			

	Page		Page.
Cladornithidae.....	723	Columba auricularis	712
Cladurus	674	fusca	717
Clamator	674	grisea	692
Claravis	674	guinea	678
Clariger, new genus.....	37, 120, 132	histrionica	688
cosmurus, new species.....	120, 121, 132	hodgsoni	677
Claudia	674	livia	714
Clelia	187	mayeri	699
cloelia	189	migratoria	719
doliata	187, 188	nigrirostris	700
Cleptornis	674	nipalensis	677
Clibanus	674	oxyura	713
Clidiophora gouldiana	511, 564	palumbus	703
trilineata	511, 563	picturata	688
Clubiona inclusa	219	plumbea	166
Clubionidae	218	polleni	666
Clytolaema aurescens	323	puella	671
Clytospiza	674	tranquebarica	700
Cnemidophorus lemniscatus.....	184	Columbarium	535
Cnemophilus	674, 693	Columbidae	166, 723, 724
macgregorii	674	Columbigallina passerina	167
Cobalus arita, new species	441	Colymbetes	674
fortis, new species	440	Colymbidae	724
rastaca, new species	440	Compsortyx	675
Coccothraustes olivaceus	689	Compospiza	675
Coccyzoenas	674	garleppi	675
Coccyzura	720	Compsotis	675
Coccyzus melanocoryphus.....	170	Conepatus	162
Cocornis	674	Coniornis	675
agassizi	674	altus	675
Codiaceae	269	Constrictor	184
Codium	267, 269	constrictor	185
tomentosum	269	Contipus	688
Coelogenys paca	141	Contopus	688
Coeloteron	674	Conuropsis	675
Coendow prehensile	161	Conurus	169
Coereba luteola	176	Conus stimpsoni, new species	503, 563
Cerebidae	176, 723	Coquillet, D. W., on New Diptera from	
Cola azul	337	Southern Africa	27
larga	337	Coraciidae	724
verde	337	Coracocichla	675, 695
Colibri	321	Coracopitta	675
buckleyi	309, 320	Coralliophila	535
cyanotis	319	Corallus	184
cyanotus	319	Corapitta	675
cyanotus cabanidis	319	Corethrura	714
delphinae	319	Coris	613, 640, 641, 643, 662
iolatus	320, 321	angulata	641
jolata	320	aygula	640, 611, 662
thalassinus	319	formosa	643
Colinus	674	pulcherrima	643
Collection of Hummingbirds from Ecu-		Cormoran	688
ador and Colombia, Catalogue of a, by		Cornix	675
Harry C. Oberholser	309	Corydæ	175, 724
Colombia and Ecuador, Catalogue of a		Corvus calvus	671
Collection of Humming birds from, by		graculus	675
Harry C. Oberholser	309	gymnocephalus	684
Colorado Desert, the Fossil Fresh-water		monedula	675
Shells of the, Their Distribution, En-		moriolum	702
vironment, and Variation, by Robert		Corydon	675
E. C. Stearns	271	Coryphæna japonica	489
Coluber abætulla	187	sinensis	489
clelia	187	Coryphanoides	488
Columba	666, 678, 692, 700	houttuyni	489
antarctica	677	houttuynijaponicus	488
antarctica v. dilopha	677	Coryphœnas	675
aromatica	677	Coryphopterus glaucofrænum	54

	Page.		Page.
<i>Corythoichthys crassa</i>	691	<i>Crayracion lineatus</i>	251
<i>Corythoichthys</i>	5, 7, 19	<i>spengleri</i>	231, 249
<i>albirostris</i>	7	<i>Creaphora</i>	705
<i>isigakius</i> , new species ..	7, 19	<i>Creccoides</i>	675
<i>Cosmophoneus</i>	675	<i>osbornii</i>	675
<i>Cossypha</i>	694	<i>Creccoides</i>	675
<i>Cossyphodes</i>	614	<i>Creccopsis</i>	675
<i>macrodon</i>	614	<i>Crenella</i>	559
<i>Cossyphus anchorago</i>	616	<i>faba</i>	508, 564
<i>atrolumbus</i>	618, 619	<i>megas</i> , new species	559
<i>axillaris</i>	617	<i>pectinula</i>	507, 508, 564
<i>japonicus</i>	614	<i>Crenilabrus aurigarius</i>	623
<i>microlepidotus</i>	621	<i>rubellio</i>	624
<i>neilli</i>	617	<i>spilogaster</i>	624, 625
<i>oxycephalus</i>	619	<i>Crex egregia</i>	675
<i>perditio</i>	618, 619	<i>Crocidura</i>	776, 777
<i>reticulatus</i>	621	<i>andamanensis</i> , new species ..	777
<i>unimaculatus</i>	619	<i>murina</i>	778, 792
<i>Cotingidæ</i>	724	<i>nicobarica</i> , new species	777
<i>Cottidæ</i>	347	<i>777</i> , 778, 792	776
<i>Cottunculus</i>	347	<i>Crocomorphus</i>	676
<i>Coturnicops</i>	701	<i>Crosswise puffer</i>	255
<i>Coturniculus</i>	917	<i>Crotophaga ani</i>	169
<i>obscurus</i>	916, 917	<i>Crustaceans from the West Coast of North</i>	
<i>savannarum bimaculatus</i> ..	916, 917	<i>America, Descriptions of New Decapod,</i>	
<i>floridanus</i> ,		<i>by Mary J. Rathbun</i>	885
new subspe-		<i>Crypticus</i>	681
cies	915, 916, 917	<i>Cryptillas</i>	676
<i>passerinus</i>	915, 916, 917	<i>Cryptocentrus</i>	35, 72, 130
<i>perpallidus</i>	916	<i>cryptocentrus</i>	72
<i>savannarum</i>	916, 917	<i>filifer</i>	72, 130
<i>Cotylis ventricosus</i>	346	<i>Cryptophaps</i>	676
<i>Craces</i>	684, 724	<i>Cryptornis</i>	676
<i>Cracidæ</i>	165, 724	<i>Cryptotomus</i>	656
<i>Crangon</i>	888	<i>Crypturus soui</i>	163
<i>abyssorum</i> , new species	890	<i>Crystallias</i> , new genus	347, 349
<i>acclivis</i> , new species	890	<i>matsushimæ</i> , new species ...	349, 350
<i>alaskensis</i>	888	<i>Crystallichthys</i>	349
<i>alaskensis elongata</i> , new sub-		<i>Ctenidæ</i>	223
species	888	<i>Ctenogobius</i>	35, 54, 58, 67, 74, 76, 113, 130
<i>alba</i>	888	<i>abei</i> , new species	54, 55, 130
<i>communis</i>	889, 890	<i>campbelli</i> , new species ...	54, 62, 130
<i>dalli</i> , new species	889	<i>fasciatus</i>	54
<i>franciscorum</i>	889	<i>gymnauchew</i>	54, 58, 130
<i>franciscorum angustimana</i> , new		<i>hadropterus</i> , new species ..	54, 60, 130
subspecies	889	<i>pflaumi</i>	54, 63, 64, 65, 130
<i>holmesi</i> , new species	888	<i>similis</i>	54, 56, 77, 130
<i>munita</i>	890, 891	<i>virgatulus</i> , new species ..	54, 63, 66, 130
<i>nigricauda</i>	888	<i>Ctenoides albicoma</i>	507
<i>resima</i> , new species	889	<i>Ctenolabrus flagellifer</i>	623
<i>spinirostris</i> , new species ..	891	<i>Cuculidæ</i>	169, 724
<i>spinosissima</i> , new species ..	891	<i>Cucullaria sagrinata</i>	508, 563
<i>variabilis</i> , new species	890, 891	<i>Cuculus glandarius</i>	674
<i>Crangonidæ</i>	888	<i>smaragdinus</i>	695
<i>Crania</i>	562	<i>Cucumber-fish</i>	587
<i>pantagonica</i> , new species ..	562	<i>Culius fuscus</i>	44
<i>suesii</i>	562	<i>niger</i>	45
<i>Craspedophora duivenbodei</i> ..	704	<i>Cumana</i>	676
<i>mantoui</i>	687	<i>Cuphopterus</i>	688
<i>Crassilabrus</i>	653	<i>Curotreron</i>	676
<i>undulatus</i>	653	<i>Cursoridæ</i>	724
<i>Cravata blanca</i>	326	<i>Cyanerpes</i>	676
<i>malva</i>	333	<i>cyanea eximia</i>	176
<i>Crawling fish</i>	372	<i>Cyanichthys</i>	258
<i>Crax daubentoni</i>	165	<i>cæruleus</i>	258
<i>Crayracion</i>	231, 249	<i>Cyanolesbia</i>	676
<i>implutus</i>	251, 252		

	Page.		Page.
Cyanolesbia coelestis.....	337	Dammeria.....	677
cyanura.....	336	henrici.....	677
gorgo.....	336	Damophila julie.....	318
kingi mocoa.....	336	feliciana.....	318
kingii caudata.....	336	Danainæ.....	383
emma.....	336	Daphnositia.....	677
kingii.....	336	miranda.....	677
margarethæ.....	336	Daphnella eugrammata, new species.....	503, 563
mocoa.....	336	Darwinornis.....	677
smaragdina.....	336	copei.....	677
nehrkorni.....	698	Dasyllus xanthurus.....	601
Cyanopitta.....	676	Dasycephala syndactyla.....	670
Cyclichthys.....	258	Dasyprocta.....	161
orbicularis.....	258	Decapod Crustaceans from the West Coast of North America, Descriptions of New, by Mary J. Rathbun.....	885
Cyclogaster.....	348	Deconychura.....	677
Cyclopterichthys.....	344, 345	typica.....	677
glaber.....	345, 346	Deltarhynchus.....	677
ventricosus.....	345, 346	Dendrocolaptidæ.....	174, 724
Cyclopteridæ.....	343, 347	Dendrophaps.....	677
Cyclopterinae.....	344	Dendrophassa.....	677
Cyclopteroides.....	344	Dendrophila.....	677
Cyclopterus.....	344, 346	Dendroplex picirostris.....	174
liparis.....	348	Dendrotetreron.....	677
ventricosus.....	346	Depressaria.....	731, 732, 733, 737, 740, 742, 749
Cyclosa thorelli.....	221	abysinthiella.....	749
Cyclosemia trigonilla, new species.....	430	amyrisella.....	733, 735, 741
Cylicna.....	287	aplana.....	732, 735, 739
verillii.....	502, 563	arenella.....	732, 735, 743, 744
Cymænæ dubitans, new species.....	457	argillacea.....	732, 735, 738, 739
intermedia, new species.....	458	arnicella.....	732, 735, 738
nux, new species.....	457	atrodorsella.....	731, 732, 734, 736
occulta, new species.....	458	barberella, new species.....	735, 747, 748
Cymatobolus.....	676	betullella, new species.....	735, 746
Cymindis.....	676	canadensis, new species.....	735, 744
Cymindus.....	676	ciliella.....	732, 735, 739
Cynanthus coelestis.....	337	cinereocostella.....	731, 735, 749
Cynopterus.....	787	ciniffonella.....	733, 734, 740, 741
brachyotis.....	787, 792, 793, 794	clausella.....	731
brachyotus.....	787	confertella.....	731
brachysoma.....	787, 792, 793, 794	curviliniella.....	733, 734, 742
giganteum.....	795	dictamiella.....	748
marginatus.....	787, 788, 793, 794	emeritella.....	732, 735, 746
var. andamanensis.....	787, 794	eupatoriella.....	732, 733, 737
montanoi.....	788	fernaldella.....	732, 733, 739, 740
scherzeri.....	788, 792, 793, 794, 795	fulva.....	732, 735, 741
sphinx.....	788	fulvipennella.....	737
Cynorta obscura, new species.....	226	georgiella.....	731
Cyphorhina.....	676	gracilis.....	733, 734, 737
Cypselus melanoleucus.....	665	grotella.....	731, 732, 735, 748
squamatus.....	674	Haworth, a Review of the American Moths of the Ge- nus, with Descriptions of New Species, by August Busck.....	731
Cytherea conradina.....	509	heracliana.....	731, 735, 748, 749
simpsoni.....	510	hilarella.....	732, 733, 745
texasiana.....	509	klamathiana.....	732, 734, 740
Daba.....	607	lecontella.....	731, 735, 745
areolatus.....	607	lythrella.....	733, 735, 744
Dacnis xanthophthalma.....	710	muricolorella, new species.....	735, 741
Dactylortyx.....	676	nebulosa.....	732, 734, 741
Dacus brevis, new species.....	28	nervosa.....	732, 735, 747
immaculatus, new species.....	29	novi-mundi.....	732, 735, 740
lounsburyi, new species.....	27	nubiferella.....	732, 735, 745
sigmoides, new species.....	29	ontariella.....	731, 748
Dædalion rufifrons.....	169	pallidochrella.....	732
Dafilula.....	677		
Dall, William Healey, on Illustrations and Descriptions of New, Unfigured, or Im- perfectly Known Shells, Chiefly Ameri- can, in the U. S. National Museum.....	499		

	Page.		Page.
Depressaria parillella	732, 740	Didelphys brevicaudata	138
parillella var. novi-mundi....	740	philander	138
persicocella	733	Diglossa aterrima	320
posticella	732, 735, 744	Dilobomycter	249
psoralicella	732, 734, 740	reticularis	249
pulvipennella ...	731, 732, 733, 735, 737	Dilobomyctères	249
rileyella	732	(Dilobomycter)	249
robinicella	731, 732, 733, 735, 745	Dilobus	678
sabulella	732, 735, 743	Dilophus	705
sanguinella, new species	735, 738	Dinemellia	692
scabella	732, 735, 749	Dinoramphus	678
scabrella	749	Dinornis	720
senicicella	735, 742, 743	didiformis	695
senicionella, new species	742	elephantopus	702
solidaginis	733, 737	giganteus	696
subpropinquella	743	gracilis	720
thoracefasciella	732, 735, 740	ingens	697
thoracenigræella	732, 734, 736	Dinornithidæ	724
togata	733, 735, 746	Diodon	256, 258, 264
umbraticostella	732, 734, 736	atinga	256, 258
versicolorella	732	carinatus	261
walsinghamella	733, 734, 739	holacanthus	257, 264
yeatiana	732, 738, 743	hystrix	256, 257, 258
Depressariæ	731	liturosus	257
Dermanura quadrivittatum	150	maculatus	257
Dermatostethus punctipinnis ..	6	melanopsis	257
Descriptions and Illustrations of New,		multimaculatus	257
Unfigured, or Imperfectly		novemmaculatus	257
Known Shells, Chiefly		quadrimaculatus	257
American, in the U. S. Na-		sexmaculatus	257
tional Museum, by Wil-		spinosissimus	257
liam Healey Dall	499	tachete	257
of New American Butter-		tigrinus	258
flies, by William Schaus ..	383	Diodontidæ	229, 230, 232, 256, 259, 264
of New Decapod Crustaceans		Diphlogæna hesperus	326
from the west coast of		Diphogena hesperus	326
North America, by Mary J.		iris	326
Rathbun	885	Diplanchias	260
of Three New Birds from the		mola	260
Southern United States, by		nasus	260, 261
Edgar A. Mearns	915	Diplocercus	679
Desmodus rotundus	147	Diplura	679
rufus	147	Dipsalco	679
Dialiptila	678	Diptera from Southern Africa, New, by	
Dialis	678	D. W. Coquillett	27
Diamond puffer	258	Dircenna hugia, new species	383
Diaphorapteryx	678	Discobolous Fishes of Japan, A Review of	
Diaphorillas	678	the, by David Starr Jordan and John	
Diaphoropterus	678	Otterbein Snyder	343
Diastodon	616	Dissemurulus	679
scrofa	616	Dissemurus	679
speciosus	616	Ditrema	354, 355, 356, 357
unimaculatus	619	læve	357
Diatropornis	678, 718	smitti	357
Diatropura	678	temminckii	356, 357, 359
Dicæidæ	724	Djabub	607
Dichotomycter	249	yarbus	607
fluviatilis	249	Docimastes ensiferus schliephackei ..	327
Dichotomyctères	249	schliephackei	327
(Dichotomycter)	249	Dog salmon	572
Dichrognathus	678	Dogoro	599, 600
Dicotyles tajacu	139	Doleromyia fallax	172
tajassu	139	Dolomedes marginellus	224
Dicruridæ	724	Dolychoeix	679
Dicrurus lophorinus	679	Donacias	679
Dictæa	678	Donacophilus	679
Didelphis karkinophaga	137	Dorado	330

	Page.		Page.
Dorifera johannæ	310	Ellisia	699
Doriphonus	679	Elornis	681
Dormitor	43	antiquus	681
Doryfera johannæ	310	Emarginata	681
ludovicæ	310	flabellum	555
rectirostris	310	Emberiza schœniculus	714
rectirostris	310	Emberizoides	678
Drachinus trichodon	483	Embernagra rufivirgata	668
Drepananax	679	Embiotoca	354, 357
Drepanidæ	1724	smitti	357
Drepanis	678	Embiotocidæ	353, 357
funerea	679, 680	a Review of the Japanese	
Drepanoptectes	639	Species of Surf-fishes or,	
jacksoni	679	by David Starr Jordan, as-	
Drepanorhamphus	679, 680	sisted by Michitaro Sindo.	353
Drepanorhynchus	679, 680, 716	Embiotocinæ	354
schistaceus	679	Enaliornis	681
Drepanornis bruijnii	679	Enaliornithidæ	724
Drillia empyrosia	516, 565	Endomychura	681, 696
perversa	513	Enicostoma packardella	742
Dromornithidæ	724	Ensifera ensifera	327
Drymobius boddaerti	186	schliephackei	327
Dryocolaptes	680	Entomyzon	681
Dryolimnas	680	Enygrotheres	681
Dryornis	680	Eoneornis	681
pampeanus	680	australis	681
Dugong	752	Epeira balaustina	221
dugon	752, 792, 794	clavispina	222
Dupetor	680	conchlea	222
Duymæria	613, 623, 661	fasciata	221
amboinensis	624	fusco-vittata	221
aurigaria	623, 624	granadensis	222
flagellifera	623, 625, 661	labyrinthea	221
japonica	624	mangareva	221
Dybowskiæ	680	oaxensis	221
kemoensis	680	parvula	222
Dynamopterus	680	prompta	222
velox	680	purpurascens	221
Ecmeles	680	rectangula	221
Ecphora	522	theisii	221
Ecephymotes	183	trivittata	222
Ecuador and Colombia, Catalogue of a		Epeiridæ	220
Collection of Hummingbirds from, by		Eperlanus	586
Harry C. Oberholser	309	eperlanus	586
Eight-eyed puffer	257	Epinephelus areolatus	607
Einalia	680	Epipedorhynchus	249
Elachura	680, 716	Epipedorhynques	149
Elainea placens	697	(epipedorhynchus)	249
Elanoides	681	Episcada carcinia, new species	384
Elaphrocnemus	680	pascua, new species	384
phasianus	680	Eranna jucunda	317
Elasas	681	Eremiornis	681
Elasmonetta	681	carteri	681
Elathea	681	Eremophila	805
Electron	681	alpestris b leucolæma	820, 855
Eleotrinæ	35	Eremophilus	805
Eleotriodes muralis	42	Eremopterix	682
Eleotris	35, 42, 44, 130	Eresia crina, new species	392
cantherius	46	Ereunetes pusillus	164
fusca	45, 130	Eribates	682
longipinnis	42	Eriocnemis	721
mauritanus	45	a. Engyete aline	331
muralis	42	luciani	329
nigra	45	mosquera	330
obscura	43	smaragdinipectus	330
oxycephala	45, 46, 130	γ. Threptria derbyi	331
pisonis	44	lugens	330

	Page.		Page.
<i>Eriocnemis vestita smaragdinipectus</i>	330	<i>Euptychia ocelloides</i> , new species	387
<i>Eriocnemys nigrivestis</i>	331	<i>pallema</i> , new species	389
<i>Eriopus lugens</i>	330	<i>undina</i>	387
<i>Eris illustris</i>	225	<i>Eurhinospiza</i>	683
<i>Erychthys</i>	658	<i>henrici</i>	683
<i>croicensis</i>	658	<i>Eurillas</i>	683
<i>Erycininae</i>	397	European brook trout	577
<i>Erythra</i>	707	<i>Euroto coler</i> , new species	443
<i>Erythrobuco</i>	682	<i>etelka</i> , new species	443
<i>Erythrocnus</i>	682	<i>purgis</i> , new species	443
<i>Erythrolimnas</i>	682	<i>ritans</i> , new species	443
<i>Erythrophox</i>	682	<i>Euryceros</i>	665
<i>Erythropsiza</i>	716	<i>Eurygona cucuta</i> , new species	397
<i>Erythrotriorchis</i>	682	<i>enoras</i>	398
<i>Esmeraldas</i>	331	<i>eupiola</i>	398
<i>Estrella de chimborazo</i>	322	<i>micaela</i> , new species	397
<i>Estrilda melanogaster</i>	694	<i>ransonea</i> , new species	398
<i>Estuary puffer</i>	243, 244	<i>tarinta</i> , new species	398
<i>Etoimus</i>	682	<i>Euryonotus</i>	683
<i>Eubrontes</i>	663	<i>brachypterus</i>	683
<i>Eubucco</i>	664	<i>Eurypterus</i>	683
<i>Eucephala</i>	317	<i>Euryzona canningi</i>	672
<i>Euchoristopus koelreuteri</i>	49	<i>Euschistodus</i>	607
<i>Eucora</i> , new genus	400	<i>declivifrons</i>	607
<i>sanarita</i> , new species	400	<i>Eustala conchlea</i>	222
<i>Eucorax</i>	682	<i>prompta</i>	222
<i>Eucorystes</i>	721	<i>Eutsenlichthys</i> , new genus	37, 122, 132
<i>Euetenogobius badius</i>	54	<i>gilli</i> , new species	122, 132
<i>Eudamidas melander</i>	431	<i>Eutelornis</i>	683
<i>obscurior</i> , new species	431	<i>patagonicus</i>	683
<i>Eudamus callias</i>	425	<i>Euthria conulus</i>	526
<i>callicina</i> , new species	425	<i>Eutoxeres aquila heterura</i>	314, 315
<i>janita</i> , new species	426	<i>heterurus</i>	314
<i>pithys</i> , new species	426	<i>baroni</i>	309, 314, 315
<i>Eudromias australis</i>	705	<i>condamini</i>	314
<i>Euetheia omisa</i>	175	<i>condaminii</i>	314
<i>Eugenia imperatrix</i>	325	<i>heterura</i>	314
<i>Eugnatha gracilis</i>	220	<i>Eutyche asena</i>	441
<i>pallida</i>	220	<i>astiga</i> , new species	441
<i>Eugralla</i>	682	<i>barnesi</i> , new species	442
<i>Euhierax</i>	682	<i>petrovna</i> , new species	441
<i>Euhyas</i>	683, 721	<i>Excalfactoria</i>	675
<i>Eulacostoma</i>	683	<i>Fabricius</i>	520
<i>nigropectus</i>	683	<i>Falcinellus</i>	683
<i>Eulipoa</i>	688	<i>Falco albogularis</i>	158, 169
<i>Eumathes</i>	683	<i>bellicosus</i>	707
<i>Eumicrotremus</i>	344	<i>buteo</i>	692
<i>Eumycterias</i>	254, 264	<i>ferrugineus</i>	671
<i>bitæniatus</i>	254, 255, 256	<i>peregrinus</i>	682
<i>rivulatus</i>	255, 264	<i>radiatus</i>	682
<i>Eupatorium</i>	737	<i>uncinatus</i>	169
<i>Eupemis</i>	643	<i>Falconidæ</i>	168, 724
<i>fusiformis</i>	643	<i>Fallax</i>	172
<i>Eupherusa cupreiceps</i>	691	<i>Farer</i>	607
<i>Euphyes menopis</i> , new species	446	<i>sammara</i>	607
<i>Euplectes</i>	689	<i>Fario</i>	577
<i>Eupleura</i>	533	<i>argenteus</i>	577
<i>Eupomacentrus</i>	600	<i>argyreus</i>	570
<i>lividus</i>	600	<i>trutta</i>	577
<i>Eupterornis</i>	683	<i>Fedoa</i>	683
<i>remensis</i>	683	<i>americana</i>	683
<i>Euptychia borasta</i> , new species	389	<i>Felis</i>	162, 773
<i>burgia</i> , new species	388	<i>cacomitl</i>	207, 209
<i>castrensis</i> , new species	387	<i>cacomitli</i>	207, 209
<i>moneca</i> , new species	388	<i>calomitti</i>	207
<i>morima</i> , new species	389	<i>chaus</i>	773, 792, 793, 794
<i>narapa</i> , new species	388	<i>yaguarondi tolteca</i>	208, 209

	Page.		Page.
<i>Felis yaguarundi</i>	207, 208, 209	Foreign trout	577
<i>Filholornis</i>	684	Formicariidae	174, 724
<i>paradoxa</i>	684	Formicicapa	684
<i>Filistata capitata</i>	218	Formicivora intermedia	174
<i>cubæcola</i>	218	Fossil Fresh-water Shells of the Colorado	
<i>Filistatidae</i>	218	Desert, their Distribution, Envi-	
<i>Finos</i>	338	ronment, and Variation, the, by	
Fishes and Related Forms Found in the		Robert E. C. Stearns	271
Waters of Japan, a Review of the		shells, bibliography of	297
Labroid, by David Starr Jordan and		<i>Fossularca adamsi</i> var. <i>conradiana</i>	508
John Otterbein Snyder	595	<i>Foudia eminentissima</i>	699
Fishes and Their Supposed Allies Found		<i>flavicans</i>	699
in the Waters of Japan, a Review of the		Fox perch	619
Trachinoid, by David Starr Jordan and		Fragrant fish	584
John Otterbein Snyder	461	<i>Francolinus</i>	697
Fishes of Japan, a Review of the Ather-		<i>Fregata aquila</i>	164
ine, by David Starr Jordan and Edwin		<i>Fregatidae</i>	164
Chapin Starks	199	Fresh-water Shells of the Colorado Desert,	
Fishes of Japan, a Review of the Disco-		the Fossil, their Distribution, Environ-	
bolous, by David Starr Jordan and		ment, and Variation, by Robert E. C.	
John Otterbein Snyder	343	Stearns	271
Fishes of Japan, a review of the Gym-		<i>Fringilla anna</i>	673
nodont, by David Starr Jordan and		<i>arvensis</i>	715
John Otterbein Snyder	229	<i>capensis</i>	671
Fishes of Japan, a Review of the Hypos-		<i>celeno</i>	713
tomide and Lophobranchiate, by David		<i>chlorura</i>	700
Starr Jordan and John Otterbein Snyder		<i>cruciger</i>	682
.....	1	<i>formosa</i>	717
Fishes or Anglers of Japan, a Review of		<i>granatina</i>	685
the Pediculate, by David Starr Jordan,		<i>manimbe</i>	697
assisted by Michitaro Sindo	361	<i>nivalis</i>	685
Fishes of Japan, a Review of the Salmon-		<i>otoleucus</i>	682
oid, by David Starr Jordan and John		<i>Fringillidae</i>	175, 725
Otterbein Snyder	567	Frog-fishes	367
Fishes of Japan, with Descriptions of		puffer	258
Twenty-one New Species; a Review of		<i>Fucus</i>	266
the Gobioid, by David Starr Jordan and		<i>Fulica newtoni</i>	703
John Otterbein Snyder	33	<i>Fulicopus</i>	663
Fishes, Surf, or Embiotocidae, a Review		<i>Furcaria</i>	599
of the Japanese Species of, by David		<i>multilineatus</i>	599
Starr Jordan, assisted by Michitaro		<i>puncta</i>	599
Sindo	353	<i>Furnariidae</i>	174, 725
<i>Fistularia paradoxa</i>	4	<i>Furnarius roseus</i>	177
<i>Flaccilla coatepeca</i> , new species	458	<i>Fusus</i>	520, 521, 324, 585, 536, 537, 542, 547, 548
<i>ergola</i> , new species	459	<i>banffius</i>	537
<i>Flacourtia</i>	684	<i>banffius</i>	537
Flapper	483, 484	<i>behringii</i>	528
Flat-tail	591	<i>berniciensis</i>	524
Flightless Auk, <i>Mancalla californiensis</i> ,		<i>conulus</i>	526
from the Miocene of California, by		<i>crispus</i>	535
Frederic A. Lucas	133	<i>deformis</i>	522, 523
<i>Floricola albicrissa</i>	340	<i>echinatus</i>	539
<i>superba</i>	340	<i>gunneri</i>	538
Florida	685	<i>islandicus</i>	520, 522
grasshopper sparrow	915	<i>kroyeri</i>	523
purple martin	918	<i>lachesis</i>	520, 522
<i>Florisuga mellivora</i>	315	<i>lamellosus</i>	547, 548
<i>mellivorus</i>	315	<i>mohnii</i>	523
<i>Fluminicola</i>	279	<i>multangulus</i>	505
<i>columbiana</i>	279, 285	<i>multicostatus</i>	543
<i>fusca</i>	286	<i>norvegicus</i>	521
<i>merriami</i>	286	<i>orpheus</i>	542
<i>nuttalliana</i>	285	<i>pygmaeus</i>	520
var. <i>columbiana</i>	285	<i>quadricostatus</i>	522
Footopterus	684	<i>roperi</i>	517, 564
<i>ambiguus</i>	684	<i>scalariformis</i>	540
Foolish	599	<i>spitzbergensis</i>	526

	Page.		Page.
<i>Fusus trapezium</i>	521	<i>Gennadas borealis</i> , new species.....	887
<i>turtoni</i>	529	<i>parvus</i>	887
<i>unicarinatus</i>	536	<i>Gennæochen</i>	685
<i>variabilis</i>	539	<i>Gennæus</i>	685
<i>ventricosus</i>	520	<i>Gennaia</i>	685
<i>Gadidæ</i>	461, 462	<i>Genyornis</i>	685
<i>Gadoid</i>	461	<i>newtoni</i>	685
<i>Gadula ruficauda</i>	170	<i>Genyoroget gibba</i>	607
<i>tridactyla</i>	689	<i>Geospiza</i>	685
<i>Galbulidæ</i>	170, 725	<i>Geotrygon venezuelensis</i>	167
<i>Galeolimnas</i>	684	<i>Geranopsis</i>	685
<i>Galeopsar</i>	684	<i>hastingsiæ</i>	685
<i>salvadorii</i>	684	<i>Geranopterus</i>	685
<i>Galerida</i>	711	<i>alatus</i>	685
<i>modesta</i>	687	<i>Ghanan</i>	607
<i>Galeripitta</i>	684	<i>ghanam</i>	607
<i>Galerita</i>	711	<i>Gibbula canfieldi</i>	558, 565
<i>Galgulus</i>	684	<i>Ginfuku</i>	234
<i>Galictis</i>	162	<i>Ginmasu</i>	574
<i>Gallina</i>	684	<i>Gisu</i>	467
<i>Gallinula ventralis</i>	696	<i>Glaucero dius</i>	685
<i>Gallinuloides</i>	684	<i>Glaucis affinis</i>	311
<i>wyomingensis</i>	684	<i>columbiana</i>	311
<i>Gallirallus lafresnayanus</i>	719	<i>fraseri</i>	310
<i>Gallophasis</i>	693	<i>hirsuta</i>	311
<i>Gallus</i>	665	<i>affinis</i>	311
<i>Gambetta</i>	665, 684	<i>hirsuta</i>	311
<i>Gampsonyx swainsoni</i>	168	<i>hirsutus</i>	171
<i>Ganesa</i>	554	<i>Glossogobius</i>	36, 74, 131
<i>nitidiuscula</i>	554	<i>brunneus</i>	74, 131
<i>panamensis</i> , new species.....	554	(<i>platycephalus</i>).....	74
<i>pruinosa</i>	554	<i>Glossophaga</i>	152, 158
<i>Gasteracantha canestrinii</i>	222	<i>longirostris</i>	151, 160
<i>hilaris</i>	222	<i>soricina</i>	151
<i>quadridens</i>	222	<i>Glyphidodon</i>	607
<i>sexseriata</i>	222	<i>antjerius</i>	606
<i>tetracantha</i>	222	<i>bonang</i>	606
<i>Gasterotoceus biaculeatus</i>	11	<i>notatus</i>	611
<i>Gasterotokeus</i>	6, 11, 20	<i>saxatilis</i> var. <i>coelestinus</i>	608, 609
<i>biaculeatus</i>	11, 20	<i>smaragdinus</i>	610
<i>Gastornithide</i>	725	<i>sordidus</i>	610
<i>Gastrophysus</i>	232	<i>trifasciatus</i>	610
<i>alboplumbeus</i>	243	<i>violaceus</i>	606
<i>lunaris</i>	232	<i>Glyphidodontops</i>	605
<i>microphthalmus</i>	243	<i>azureus</i>	605
<i>rubripes</i>	238	<i>cyaneus</i>	605
<i>stictonotus</i>	235	<i>Glyphisodon</i>	596, 605, 606, 661
<i>vermicularis</i>	244	<i>abdominalis</i>	610
<i>xanthopterus</i>	239	<i>ater</i>	605
<i>Gastropoda</i>	512	<i>coelestinus</i>	608, 609
<i>Gaterin</i>	607	<i>curacao</i>	608, 610, 661
<i>gaterina</i>	607	<i>curassao</i>	610
<i>Gavia</i>	684	<i>gigas</i>	611
<i>Gelechia</i>	732, 733	<i>marginatus</i>	608, 610
<i>elemensella</i>	732, 739	<i>melas</i>	605
<i>thoracefasciella</i>	732, 740	<i>moucharra</i>	606
<i>thoracenigræella</i>	732, 736	<i>quadrifasciatus</i>	608
<i>Geneion</i>	232	<i>rahti</i>	608
<i>maculatum</i>	232	<i>saxatilis</i>	608, 610, 661
Generic Terms Proposed for Birds During the Years 1890 to 1900, Inclusive, to Which are Added Names Omitted by Waterhouse in his "Index Generum Avium," List of, by Charles W. Rich- mond.....	663	<i>sordidus</i>	607, 608, 610, 611, 661
<i>Geniatus</i>	685	<i>violaceus</i>	605
<i>Gennadas</i>	685	<i>waligiensis</i>	608
		<i>Gmelinius</i>	685
		<i>Gnathagninæ</i>	474
		<i>Gnathagnus</i>	474, 477, 497
		<i>elongatus</i>	477, 478, 480, 497
		<i>Gnathopops</i>	492, 495, 497

	Page.		Page.
Gnathypops evermanni, new species	492, 493, 497	Graius choricus, new species	429
hopkinsi, new species	492, 497	Grallaria	174
maxillosus	492	dignissima	718
Gnorimoschema	732	Grallator	663
Gobe-fourmi	684	Gramma	490
Gobiidae	34	Granatina	685
Gobiinae	35	Granigyra	554
Gobio castaneus	79	pruinosa	554
Gobioid Fishes of Japan, with Descriptions of Twenty-one New Species, a Review of the, by David Starr Jordan and John Otterbein Snyder	33	Gripeus	685
Gobiomorus gronovii	42	Griphornis	686
strigata	42	longicaudatus	686
taiboa	42	Griphosaurus	686
Gobionellus	102	Gruesos	328
Gobiosoma macrognathos	76	Gruidae	725
Gobius	35, 52, 54, 100	Grus leucauchen	709
annularis	76	leucogeranus	714
boddarti	48	Guifso balito	694
breunigi	71	Güntheria	613, 635, 661
brunneus	74	trimacula	635, 661
dolichognathus	84	trimaculatus	635
elapoides	90	Gymnobucco bonapartii	687
filifer	72	Gymnocephalus	705
flavimanus	98	Gymnocrotaphus	670, 686
geneionema	109	Gymnodont Fishes of Japan, a Review of the, by David Starr Jordan and John Otterbein Snyder	229
gymnauchen	58	Gymnodontes	229, 263
hasta	102	Gymnogobius	76
heptacanthus	70	macrognathos	75
hexanema	106	Gymnogyps	686
knutteli	72	Gymnolæmus	686
lactipes	67	Gymnops	686
lævis	80	fasciatus	686
macrognathos	76	Hæmophila stolzmanni	713
niger	52	Hagedashia	704
olivaceus	74	Hagiopsar	686
pectinirostris	47	Haliastur	686
pflaurni	65	Halicampus	5, 9, 20
pencilichthys, new species	52, 130	conspicillatus	9, 10
polynema	103	grayi	10
similis	56	kolomatodon	10, 20
stigmatias	105	Halichoeres	613, 629, 635, 636, 641, 645, 662
tannoao	49	bimaculatus	636
urotenia	71	bleekeri	637, 638, 640, 662
yokohamæ	56	pencilopterus	636, 637, 662
Goltra	583	pyrrhogrammus	637
Gomphosus	613, 649, 662	tenuispinis	639
cæruleus	649	tremebundus, new species	637, 639, 662
cepedianus	649	Halicore indicus	752, 794
fuscus	650	Halicutea	378, 380, 381
melanotus	650	stellata	380, 381
pectoralis	650	stellatus	380
tricolor	649, 650, 662	Halicuteinae	378
varius	649, 650, 662	Halinceda	269
Gonatodes vittatus	181	Halinertus	686
Gonbekusabi	623	Halobates	686
Gongoro	599	Hamearis dovina, new species	404
Gorgopas viridiceps	430	erostratus	405
Gorgythion beggoides, new species	431	Hapaloderma vittatum	687
marginata, new species	431	Haploenas	686
pyralina	431	Haplopyga	686
Gouldia conversi æquatorialis	342	Haplostemma hamiltoni	501, 563
Gracula cyanotis	681	Harid	607
sturnia	665	harid	607
Graculus	685	Harifuku	257
Gracupica	691	Harisembon	257
		Harpe	699

	Page.		Page.
Harpedactylus	663	Hemithyris	562
Harpia	667	Hemiulius	643
Harpyia	667	vittatus	643
Hata-hata	483, 484	Henicops	797, 798, 800
Hazeus	35, 51, 130	chilensis	797
otakii, new species	51, 56, 130	Dolichopus, a New Chilopod from Utah, by Ralph V. Cham- berlin	797
Head-fishes	259	dolichopus, new species	797
Heliangelus amethysticollis	333	fulvicornis	25, 797
exortis	333, 334	Hepburnia	707
exortis	333, 334	Herophilus	687
soderstromi, new sub- species	334	Hesperia altama, new species	455
strophianus	333	caligula, new species	456
viola	334, 721	misera, new species	456
violicolis	333	sucova, new species	455
Helianthea coeligena columbiana	326	Hesperiidae	383, 424
fulgidigula	326	Hesperornithidae	725
hamiltoni	325	Heterhyphantes	687
iris	326	Heterocnemis	715
lutetiae	325	Heterocnus	164, 687
hamiltoni	309, 325	Heteromys melanoleucus	142
lutetiae	325	Heteropelma	715
torquata	325	Heteropoda venatoria	223
wilsoni	326	Heteropsar	687
Helianthus pumilus	736	Heteroptilorhis	687
Heliases	599	Heterospingus	687
insolatus	599	Heterotetrax	687
Heliastes	599	Heterotis	687
notatus	599	Heterotrogon	687
Heliobucco	687	Hiagio	591
Heliocorys	687	Hilarocihla	688
Heliodoxa jacula	324	Himatione dolei	703
henryi	324	Himatione parva	713
jamersoni	324	stejnegeri	673
jamesoni	324	Hinnites	303
leadbeateri	324	Hippocampinae	6
parvula	324	Hippocampus	6, 12, 13, 20
Heliomaster albicrissa	340	aterrimus, new species. 13, 14, 15, 20	
Heliopais	687	brevirastris	18
Heliopetes purgia, new species	434	comes	15
sublinea, new species	434	coronatus	13, 18, 20
Heliornithidae	725	gracilissimus	12
Heliothrix auritus	339	guttulatus	15, 16
barroti	339, 340	hippocampus	13, 18
barroti alincius	339	histrix	13, 16, 20
purpureiceps	339	japonicus	13, 16, 20
violifrons	339	kelloggi, new species	13, 14, 20
Heliothryx auritus	339	kuda	13, 14, 15, 16, 20
Heliotropis	522	longirostris	14
Helisoma ammon	296	melanospilus	15
trivolvus	293, 296	mohnikei	13, 17, 18, 20
Hemicoris	641, 642	moluccensis	15
variegata	642	monickei	15
Hemiderma brevicaudum	152	polytania	15
Hemiglyphidodon	607	punctulatus	15
plagiometopon	607	sindonis, new species	13, 17, 20
Hemigymnus	613, 634, 661	taniopterus	15
fasciatus	634, 635, 661	Hippolyte spinus	893
leucomus	635	Hippolytidae	893
melanopterus	634	Hipposideros	781
melapterus	634, 661	bicolor	781, 782, 793, 794
Hemistoma	658	diedemata	781
pepo	658	fulvus	781, 782
reticulatus	658	murinus	778, 792, 793
Hemitautoga	635	nicobarensis	781, 793, 794
centiquadra	635	nicobaricus	792
Hemithraupis	687, 716		

	Page.		Page
Hipposideros nicobarulæ, new species	781, 782, 792	Hypostomide and Lophobranchiate Fishes of Japan, a Review of, by David Starr Jordan and John Otterbein Snyder	1
Hippurites	304, 306	Hypostomides	1, 19
flabellifer	301, 303, 304	Hypseleotris cyprinoides	40
Hirao	391	Hypselornis	689
Hirundinidæ	176, 725	sivalensis	689
Hirundo nigricans	667	Hypsicometes	469
pelagica	705	gobioides	469
pratincta	708	Hypsifario	568
riparia	713	kennerlyi	568, 575
urbica	673	Hypsigenys	614
Hirundolanus	688	macrodon	614
Hishibuku	258	Hypsinotus humiles	219
Histrio	368, 371	Hypuroptila buffoni	172
Histriophaps	688	Hysterochrysalis traski	354
Hiuwo	584	Ibididæ	725
Hobar	607	Ibidopsis	689
fulviflamma	607	hordwelliensis	689
Holacanthus	232	Ice-fish	591
Holconoti	353	Ice-fishes	591
Holocentrus sammara	607	Ichthyacanthus	636
Hologymnosus	641	dimidiata	636
fasciatus	641	dimidiatus	636
Holospira hamiltoni	501, 563	Ichthyoscopina	473
Homopelia	688	Ichthyoscopus	473, 476, 497
Honbera	638	inermis	476
Horizocerus	688	lebeck	476, 497
Horizopus	688	lebeckii	476
Horizorhinus	688	Icteridæ	175, 725
Hoshifukuto	250	Icterus auricapillus	175
Houbaropsis	688	Idiornis	689, 701
Houppifer	688	Ifrita	689
Hucho	568, 580, 593	coronata	689
blackstoni	580, 593	Igami	657
hucho	580, 581	Iguana iguana	182
Hummingbirds from Ecuador and Colombia, Catalogue of a Collection of, by Harry C. Oberholser	309	rhinolophus	182
Humpback salmon of Alaska	569	Illustrations and Descriptions of New, Unfigured, or Imperfectly Known Shells, Chiefly American, in the U. S. National Museum, by William Healey Dall	499
Husband	654	Ilyonetta	690
Hyalopatina rushii	502, 563	Imperfectly Known Shells, Chiefly American, in the U. S. National Museum, Illustrations and Descriptions of, by William Healey Dall	499
Hydranassa	688	Incauliza	690
Hydrobates	686, 688	Indicator xanthonotus	709
Hydrobia	275	Indicatoridæ	725
seemani	277	Iniistius	614, 654, 662
Hydrobiinæ	275	den	654, 655, 662
Hydrocorax	680, 688	pavo	654
melanoleucus	694	Inocaulis	279
Hyetoceryx	689	Insignipitta	690
Hyla crepitans	181	Inuus cynomolgus	789
renulosa	180	Ionolaima schreibersii	324
Hylaærops	689	Ipnodomus	690
Hylke	689	Iridio	636
Hylocha	317	radiatus	636
Hylocharis grayi	317	Ischnochiton	558
Hylophilus aurantiifrons	177	magdalenensis	558
Hylorchilus	689	sarcosus, new species	558
Hymenodora frontalis, new species	904	stearnsii, new species	557
Hyperanthus	689	Ischnocolus	218
Hypericum	745	Iso, new genus	199, 204
Hyperprosopon	354	flos-maris, new species	205
Hyphantornis superciliosus	702		
Hyphantospiza	689		
Hypocharmosyna	689		
Hypocrites	689		
Hypocritichthys	354, 355		
Hypomesus	588		
olidus	588		

	Page.		Page.
<i>Isometrus filum</i>	225	Jordan, David Starr, and John Otterbein	
<i>maculatus</i>	225	Snyder, on A Review of the Hyposto-	
<i>Ithomeis lauronia</i> , new species	405	mide and Lophobranchiate Fishes of	
<i>Ithomia salcata</i> , new species	386	Japan	1
<i>Ito-uwo</i>	580	Jordan, David Starr, and John Otterbein	
<i>Itys</i>	690	Snyder, on A Review of the Labroid	
<i>Iwana</i>	582	Fishes and Related Forms Found in the	
<i>Ixidia</i>	690	Waters of Japan	595
<i>Ixodes</i>	690	Jordan, David Starr, and John Otterbein	
<i>Ixodia</i>	690	Snyder, on A Review of the Salmonoid	
<i>Ixos</i>	705	Fishes of Japan	567
<i>phoecephalus</i>	666	Jordan, David Starr, and John Otterbein	
<i>Izari-uwo</i>	372	Snyder, on A Review of the Trachin-	
<i>Jacaniidae</i>	725	oid Fishes and Their Supposed Allies	
<i>Jack-sardine</i>	463	Found in the Waters of Japan	461
<i>Jaco</i>	690	Jordan, David Starr, and Edwin Chapin	
<i>Janthothorax</i>	690	Starks, on A Review of the Atherine	
<i>bensbachi</i>	690	Fishes of Japan	199
Japan, a Review of the Atherine Fishes		Jordan, David Starr, assisted by Michitaro	
of, by David Starr Jordan and Edwin		Sindo, on A Review of the Japanese Spe-	
Chapin Starks	199	cies of Surf-fishes or Embiotocidae	353
Japan, a Review of the Discobolous Fishes		Jordan, David Starr, assisted by Sindo,	
of, by David Starr Jordan and John		Michaitaro, on A Review of the Pedicu-	
Otterbein Snyder	343	late Fishes or Anglers of Japan	361
Japan, a Review of the Gobioid Fishes		Jugulares	461
of, with Descriptions of Twenty-one		Julis	613, 631, 641, 642, 643, 645, 662
New Species, by David Starr Jordan and		<i>celebensis</i>	647
John Otterbein Snyder	33	<i>coris</i>	641
Japan, a Review of the Gymnodont Fishes		<i>cupido</i>	646
of, by David Starr Jordan and John		<i>dorsalis</i>	648
Otterbein Snyder	229	<i>formosa</i>	643, 662
Japan, a Review of the Hypostomide and		<i>gibbifrons</i>	641
Lophobranchiate Fishes of, by David		<i>hardwickel</i>	647, 648
Starr Jordan and John Otterbein Sny-		<i>interrupta</i>	631
der	1	<i>julis</i>	642, 643, 645
Japan, a Review of the Labroid Fishes and		<i>lunaris</i>	647
Related Forms Found in the Waters of,		<i>lutescens</i>	647, 648
by David Starr Jordan and John Otter-		<i>meniscus</i>	647
bein Snyder	595	<i>mertensi</i>	647
Japan, a Review of the Pediculate Fishes		<i>pavo</i>	645
or Anglers of, by David Starr Jordan,		<i>paecilopterus</i>	637
assisted by Michitaro Sindo	361	<i>porphyrocephala</i>	647
Japan, a Review of the Salmonoid Fishes		<i>pyrrhogramma</i>	637
of, by David Starr Jordan and John		<i>quadricolor</i>	646
Otterbein Snyder	567	<i>rubiginosus</i>	625
Japan, a Review of the Trachinoid Fishes		<i>semifasciatus</i>	648
and Their Supposed Allies Found in the		<i>spilurus</i>	635
Waters of, by David Starr Jordan and		<i>strigiventer</i>	631
John Otterbein Snyder	461	<i>thersites</i>	637
Japanese Species of Surf-fishes or Embi-		<i>trimaculata</i>	635
otocidae, a Review of the, by David		<i>urostigma</i>	648
Starr Jordan, assisted by Michitaro		<i>viridis</i>	647
Sindo	353	Jumala	529
Jaw-fishes, the	491	Kacrubuku	258
<i>Jemadia brevipennis</i> , new species	425	Kakatoe	690
<i>paulensis</i> , new species	424	Kakatoes	690
<i>Jonocicea</i>	690	Kanabuku	237
Jordan, David Starr, and John Otterbein		Kandai	614
Snyder, on A Review of the Discobolous		Kansas, Admire, Lyon County, a Newly	
Fishes of Japan	343	Found Meteorite from, by George P.	
Jordan, David Starr, and John Otterbein		Merrill	907
Snyder, on A Review of the Gobioid		Kawa-masu	578
Fishes of Japan, with Descriptions of		Kayko	572
Twenty-one New Species	33	Kelaartia	705
Jordan, David Starr, and John Otterbein		Kennerleyia bushiana	511, 563
Snyder, on A Review of the Gymnodont		Keta	572
Fishes of Japan	229	Ketupa	673

	Page.		Page.
Kianko	366	Lampropygia columbiana	326
King salmon	570	Lamprothorax	691
Kisugo	467, 486	wilhelminæ	691
Kisutch	574	Lampusia rubecula	521
Kitumakura	255	Laniarius multicolor	675
Kitsunodai	619	Laniidæ	725
Kittacincla	689	Lanioturdinus	691
Kittlitzia	668, 690, 691	Lantana	136
Koayu	584	Laridæ	164, 725
Kobudai	621	Larks of the Genus Otocoris, a Review of the, by Harry C. Oberholser	801
Kogio	584	Laroides	680
Komonbuku	243	Larus atricilla	161
Kügelchenchondrites	198	gelastes	691
Kundscha	582	Lasiurus blossevillei	160
Kuori-uwo	587	Laterallus	679
Kusuna	489	Lathrodictes mactans	219
Kyphosidæ	596	Lathrodictes dotatus	219
Labracinus	491	Latiaxis	535
cyclophthalmus	491	Laticauda	691
Labrastrum	623	primolina	330, 334
flagellifera	623	tyrianthina	334, 335
Labrichthys	625	quitensis	335
affinis	627	tyrianthina	334
cyanotaenia	625	Latilidæ	462, 488, 497
gracilis	627	Latilina	488
rubiginosa	626	Latilus	488, 497
Labridæ	488, 595, 596, 612, 649, 661	argentatus	488, 489
Labroid Fishes and Related Forms Found in the Waters of Japan, a Review of the, by David Starr Jordan and John Otter- bein Snyder	595	japonicus	489, 497
Labrus	621, 658	sinensis	489
axillaris	617	Latirus cayohuesonicus	505, 563
eothinus	626	Latrididæ	462, 482
fasciatus	634, 635	Lawrencius	691
formosus	643	Lecythoplastes	691
fusiformis	644	preussi	691
hassek	644	Leda hamata	558, 565
inermis	644	Ledidæ	558
japonicus	614, 625	Leggada andamanis	765
lunaris	647	Leistes	689
lutescens	674	Lenonias malca, new species	405
melapterus	634	Lempijius	715
merula	621	Leodonta marginata, new species	423
microlepidotus	621	Lepidaplois	612, 616, 619, 661
perditio	618	axillaris	616, 617, 661
reticulatus	621	perditio	616, 618, 661
rubiginosus	625	Lepidopleurus farallonis, new species	557
sexfasciatus	608	halistreptus, new species	556
viridis	647, 648	luridus, new species	556
zeylanicus	647	mesogonus, new species	555, 556
Laceryzon	691	Lepidopyga goudoti	316
Lady perch	469	Lepricornis tristis, new species	405
Lafresnaya lafresnayi	327	Leptodactylus ocellatus	180
saul	327	Leptognathus variegatus	192
saulæ	327	Leptomyza	691
Lagocephalus	232, 263	Leptopelia	691
alboplumbeus	243	Leptophis abactulla	187
lagocephalus	232	hocercus	187
pennanti	232	Leptopœcile elegans	693
rubripes	238	Leptopogon superciliosus	173
Lagopterus	669, 691	Leptoptera	664
minutus	691	Leptopterus	664
Lambruschinia	691	Leptorhynchus	718
Lampornis aureescens	323	Leptornis	691
iridescens	321	Leptoscoptidæ	462, 469
Lamprocolius acuticaudus	687	Leptosittaca	692
		branickii	692
		Leptotila insularis	166

	Page.		Page.
Leptourus	692	Liomesus dalei var. eburnea	531
Lepus	161	nassula	531
margaritæ	162	nux	530, 531, 565
Lerema coyana, new species	453	ovoides	531
elgina, new species	453	ovoides	531
stacara, new species	453	Lioparus	692
Lerodea tesera, new species	448	Liornis	692
Lesbia æquatorialis	337	floweri	692
gracilis	337	Liosaccus	232
Lethotremus	344	cutaneus	232
awæ, new species	344	Liparididæ	343, 347, 351
muticus	344	Liparidinæ	347
Lethrinus mahsena	607	Liparis	344, 347, 348, 350, 351
Leucocarbo	692	agassizii	348
Leucœnas	692	aleuticus	348
Leucophoyx	692	gibbus	348
Leucopsarion	87, 125, 132	liparis	348
petersi	125, 132	pulchellus	348
Leucopternis albigollis	168	Liparopsinæ	341
Leucosoma	591	Liptornis	692
reevesi	591	hesternus	692
Leucothyris mânora, new species	388	Lissogyra	554
Leucuria	692	List of Generic Terms Proposed for Birds	
phalerata	692	During the Years 1890 to 1900,	
Lewinia	679	• Inclusive, to Which are Added	
Liagora	270	Names Omitted by Waterhouse	
corymbosa	270	in his "Index Generum Avium,"	
Lichtensteinipicus	696	by Charles W. Richmond	
Lignobucco	692	the Myriapod Family Lithobiidæ,	
consobrinus	692	of Salt Lake County, Utah, with	
Lignyostola cydana, new species	429	Descriptions of Five New Spe-	
Ligurnus rufobrunneus	705	cies, by Ralph V. Chamberlin ..	
Lima albicoma	507, 564		
Limnæa	279, 288, 291, 294	Lithobiidæ	
ampla	291	Lithobius	
var. utahensis	291, 292	bipunctatus	
bonnevillensis	291, 292	collum, new species	
bulimoides	288	forficatus	
caperata	291	intermontanus, new species ..	
catascopium	291	obesus	
columella	291	purpureus, new species	
decollata	291	socius, new species	
elodes	291	utahensis, new species	
emarginata	291	xanti	
humilis	288	Lithophaps	
lanceata	291	ulnaris	
lepidæ	291	Litorina aleutica	
megasoma	288	atkana, new species	
nuttalliana	291	sitkana	
palustris	288, 291, 295	Lobihyx	
peregra	294	Lobipluvia	
stagnalis	288, 294	Lobivanellus superciliosus	
sumassi	291	Loboparadisea	
umbrosa	291	sericea	
Limnæidæ	288, 290, 291	Lobospingus	
Limnæus	692	sigillifer	
Limnogeranus	692	Loelmphopsis	
Limnophila	288	Lomvia	
Limnophyes	718	troile californica	
Limnophysa palustris	293	Lophiidæ	
Limones	692	Lophiomus	
Limopsis minuta	560	caulinaris	
panamensis, new species	559	litulon, new species ..	
Linyphia ornata	220	setigerus	
Liomesus	524, 530	362, 363, 364, 365, 366, 381	
behringiana	531	Lophiornis	
canaliculatus	531, 565	obliquus	
		Lophius	
		faujas	

	Page.		Page.
<i>Lophius histrio</i>	368, 369, 371	<i>Macacus andamanensis</i>	788, 793, 795
<i>histrio</i> var. <i>marmoratus</i>	368	<i>carbonarius</i>	790, 793, 795
<i>muricatus</i>	380	<i>cynomolgus</i>	789, 790, 793, 794
<i>pinnis dorsalibus tribus</i>	368	<i>leoninus</i>	788, 792, 793
<i>raninus</i>	369	<i>umbrosus</i> , new species	789, 790, 792, 793
<i>setigerus</i>	363, 364	<i>Macgregoria</i>	694
<i>stellata</i>	380	<i>pulchra</i>	694
<i>viviparus</i>	363	<i>Machimia tentoriferella</i>	732
<i>Lophobasileus</i>	693	<i>Machlostomus</i>	694
<i>Lophobranchii</i>	3, 19	<i>Mackerel puffer</i>	234
<i>Lopholaimus</i>	677	<i>Macrochlamys diadema</i>	499, 562
<i>Lophomyia</i>	693	<i>Macrodon sagrinata</i>	508
<i>Lophophalaris</i>	693	<i>Macroxus griseogena</i>	144
<i>Lophostoma amblyotis</i>	154	<i>Mactra richmondi</i>	510, 564
<i>bidens</i>	154	<i>Mactrella iheringi</i>	510, 564
<i>braziliense</i>	154	<i>Maifide</i>	885
<i>venezuelæ</i> , new species	154	<i>Majaqueus</i>	676
<i>Lophozosterops</i>	693	<i>Malacorhynchus</i>	694
<i>dohertyi</i>	693	<i>Malimbus</i>	669
<i>Loria</i>	693	<i>nigricollis</i>	687
<i>loriæ</i>	693	<i>rachelia</i>	669
<i>Loriidae</i>	725	<i>Malma</i>	583
<i>Loro</i>	658	<i>Malthe</i>	378
<i>guacamala</i>	658	<i>Malthopsis</i>	378, 381
<i>Louti</i>	607	<i>luteus</i>	378
<i>louti</i>	607	<i>tiarella</i> , new species	378, 379, 381
<i>Loxia astrild</i>	686	<i>Mammals Collected in the Vicinity of La</i>	
<i>moineau</i>	705	<i>Guaira, Venezuela, an Annotated List</i>	
<i>tridactyla</i>	694	<i>of, by Wirt Robinson and Marcus W.</i>	
<i>Loxigilla richardsoni</i>	695	<i>Lyon, jr</i>	135
<i>Loxornis</i>	694	<i>Mammals of the Andaman and Nicobar</i>	
<i>clivus</i>	694	<i>Islands, the, by Gerrit S. Miller, jr</i>	751
<i>Lucas, Frederic A., on A Flightless Auk,</i>		<i>Mancalla</i>	134
<i>Mancalla Californiensis, from the Mio-</i>		<i>californiensis</i>	133
<i>cene of California</i>	133	<i>californiensis, from the Miocene</i>	
<i>Luciogobiinae</i>	87	<i>of California, a Flightless</i>	
<i>Luciogobius</i>	37, 123, 132	<i>Auk, by Frederic A. Lucas</i>	133
<i>guttatus</i>	123, 132	<i>Mangilia circumata</i>	515
<i>Lump suckers</i>	343	<i>Manikup</i>	694
<i>Lunda</i>	133	<i>Manta</i>	692
<i>Lupha</i>	693	<i>Mannocodia comril</i>	682
<i>Luscinia sinuata</i>	681	<i>Margarita vorticifera</i>	554
<i>Lutianus fulviflamma</i>	607	<i>Margarites vorticiferus</i>	554, 565
<i>Lybius</i>	694	<i>Margarornis brunneescens</i>	708
<i>Lycæinæ</i>	397	<i>Marisca</i>	694
<i>Lycæna cogina</i> , new species	407	<i>Masu</i>	571, 572
<i>griqua</i> , new species	407	<i>Maugerella</i>	558
<i>Lycæninæ</i>	407	<i>Mazama</i>	161
<i>Lychas paraensis</i>	225	<i>Mearns, Edgar A., on Descriptions of</i>	
<i>Lychnidospiza</i>	694	<i>Three New Birds from the Southern</i>	
<i>Lycosa atlantica</i>	223	<i>United States</i>	915
<i>aussereri</i>	223	<i>Mearns, Edgar A., on The Cacomitl Cat of</i>	
<i>erratica</i>	223	<i>the Rio Grande Valley</i>	207
<i>fusca</i>	223	<i>Mecistura rosea</i>	670
<i>Lycosidæ</i>	223	<i>Megalapteryx</i>	694
<i>Lymanopoda varola</i> , new species	390	<i>hectori</i>	694
<i>Lymanas pelta</i> , new species	399	<i>Megalonyx</i>	682, 700
<i>Lyoliparis</i>	348	<i>nanus</i>	682
<i>pulchellus</i>	348	<i>Megalopterus</i>	673
<i>Lyon, Marcus Ward, jr., and Wirt Robin-</i>		<i>Megane-wo</i>	476
<i>son, on An Annotated List of Mammals</i>		<i>Megapodidæ</i>	725
<i>Collected in the Vicinity of La Guaira,</i>		<i>Megapodius wallacei</i>	683
<i>Venezuela</i>	135	<i>Megascops</i>	711
<i>Lysurus</i>	694	<i>brasiliensis</i>	169
<i>Mabuku</i>	238, 244	<i>Megistias carinna</i> , new species	452
<i>Macabra</i>	700	<i>chula</i> , new species	451
<i>Macacus</i>	788	<i>corescene</i> , new species	452

	Page.		Page.
Megistias corius, new species	449	Metallura	691
gispara, new species	451	primolinus	334
jamaca, new species	452	quitensis	335
miaba, new species	450	tyrianthina quitensis	335
monestes, new species	450	tyrianthinus	334
polistion, new species	450	Metapteryx	696
ranesus, new species	449	bifrons	696
sancoya, new species	452	Meteorite from Admire, Lyon County, Kansas, a Newly Found, by George P. Merrill	907
telata	449	Meteorite which Fell Near Felix, Perry County, Alabama, May 15, 1900, on a Stony, by George P. Merrill	193
vanilia, new species	451	Mezobucco	696
vorgia, new species	451	Mezotreron	696
Melagavia	695	Micranous	696
Melampitta	695	Micrastur melanoleucus	168
Melanerpes subelegans	171	Microcerculus pectoralis, new species	178
Melania	275	squamulatus	178
exigua	276, 277, 281	Microctenus	223
Melanie	276	Microglyphis	512
Melanobucco	694	breviculus, new species	512
Melanocarbo	694	Micronycteris megalotis	153
Melanocorypha	675	Micropelia	696
Melanolarus	695	Micropodidae	725
Melanophoyx	695	Microsarcoops	696
Melanospiza	695	Microstictus	696
Melanosterna	695	Microtribonyx	696
Meleagris ocellata	665	Micruria	681, 696
Melignomon	695	Milktschitsch	574
zenkeri	695	Milktschitsch	574
Meliphagidae	725	Miller, Gerrit S., jr., on The Mammals of the Andaman and Nicobar Islands	751
Melopitta	675, 695	Milnea	696
Melocactus	136	gracilis	696
Melongena corona	521	Mimetes	696
Melospiza c. juddi	802	Mimidae	726
Membras	200	Mimus	696
Mercenaria	560	Miniopterus	780
kennicottii	560	pusillus	780, 792, 793, 794
Meretrix conradina	509, 563, 564	schreibersii	780
convexa	509	Minla cinerea	715
sayana	509	Mino	683
simpsoni	510, 564	Mipus	535
texasiana	509, 564	Mirafr	682
Mergus brasiliensis	708	Misumena	223
Merrill, George P., on a Newly Found Meteorite from Admire, Lyon County, Kansas	907	asperatus	222
Merrill, George P., on a Stony Meteorite which Fell Near Felix, Perry County, Alabama, May 15, 1900	193	foliata	222
Merula fumigata	178	rosea	222
Mesembriornis	695	Mitrospingus	696
milne-edwardsii	695	Mizuko	366
Mesene martha, new species	402	Mnasalcas amatala, new species	447
simplex	402	Mnestheus petrovna, new species	457
strigulata, new species	402	Mniotiltidae	177
Mesolophus	695	Moa	696
Mesophoyx	695	Mochinouwo	653
Mesopteryx	695	Modiola pectinula	507
Mesopus	586, 588, 593	Modiolaria pectinula	507
japonicus	588, 589, 593	Mohnia	523
olidus	588, 589, 590, 593	Mola	260, 264
pretiosa	588	aculeata	260
Mesoscolopax	695	mola	260, 264
Mesosemia friburgensis, new species	399	nusus	261
mathania, new species	398	retzii	261
rhodia	399	rotunda	260, 261
Meta bigibbosa	220	Molacanthus	260
Meta puffer	237	pallasi	260
Metallococcyx	695		

	Page		Page.
Molidæ	229, 230, 259, 264	Mus stoicus, new species	758,
Mollusks, ostreiform, new genus of	301	759, 760, 761, 762, 763, 764, 765, 792	
Molossi	152	surifer	763
Molossus obscurus	158	taciturnus, new species	758, 759, 762, 764, 792
rufus	156, 158	validus	759, 760, 761
Momotidæ	726	vociferans	760, 761
Monedula	697	Musciæpa sinensis	702
Monilipitta	697	Muscicapidæ	726
Monoplex caudatus	521	Musciparus	697
Morocoys	192	tappenbecki	697
Moroko shibera	623	Muscivora tyrannus	173
Motacilla phœnicurus	706	Mustela affinis	147
Moths of the Genus <i>Depressaria</i> Haworth, A Review of the American, with Descrip- tions of New Species, by August Busek	731	Mustelirallus	684
Mountain minnow	578	Mustoxydes	697
side	578	Mycetes	162
thing	578	Mychrorynchus	697
Movia	697	Mygale erichsonii	218
Mucia matalma, new species	446	læta	217
Muertes	332	Myiarchus	677, 682
Mülleria	697	flammulatus	677
Mullerornis	697	Myiobius magnirostris	682
betsilei	697	Myiopagis	697
rudis	684	Myiosobus	697
Mullus fasciatus	634	fulvicanda	697
Murex	520, 534, 538	Myiothera ardesiaca	713
antiquus	520	Myospiza	697
bamffius	537	Myriapod Family Lithobiidæ of Salt Lake County, Utah, with Descriptions of Five New Species, List of the, by Ralph V. Chamberlin	21
calcar	539	Myrmia micrura	340
carinatus	539	Myrmochanes	697
carpenteri	532, 564	hypoleucus	697
clathratus	537	Myrtha	720
contrarius	520	Myrtis fanny	340
costatus	537	Mystrothamphus	698
craticulatus	538	Mytilus faba	508
muricatus	539	Myza	698
ostrearum	505	sarasinorum	698
petri	532, 564	Nagoya puffer	243
striatus	520	Nagoyabuku	243
vaginatus	539	Namerabuku	237
Muricidea floridana	505	Nanina	499
hemphilli	505	diadema	499, 562
multangula	505, 563	Nannochoordeiles	698
ostrearum	505, 563	Nannopterum	698
philippiana	504, 563	Napothera bivittata	697
Mus	758	Naqua	607
alexandrinus	758, 763, 765, 772, 792	gibba	607
andamanensis	758, 765, 767, 768, 772, 794	Narka	575
andamansis	765, 792	Narope marmorata, new species	390
atratus, new species	758, 767, 769, 772, 792	Nascus orima, new species	428
bowersi	758, 760, 762, 792, 793	orita, new species	428
burrescens, new species	758, 771, 792	Nassa	521
burrulus, new species	758, 770, 771, 792	reticulata	521
burrus, new species	758,	Nassaria nivea	521
768, 769, 770, 771, 772, 792		Ne, okitanago	355
flebilis, new species	758,	Necrastur	698
762, 763, 764, 765, 766, 767, 768, 792		alacer	698
manei	759, 794	Necrobyas	698
musculus	144, 758, 759, 792, 793	harpax	698
norvegicus	144, 759, 769, 770	Necropsar	698
novare	759, 795	rodericanus	698
palmarum	758, 759, 792, 795	Necropsittacus	698
pannosus	762, 763, 764	Nectariniidæ	726
pulliventer, new species	758,	Nectocrangon californiensis, new species	892
765, 766, 767, 769, 792		crassa	892
rattus	758,	dentata, new species	892
759, 762, 763, 765, 766, 767, 768, 769, 793			

	Page.		Page.
Nectocrangon lar	892	New Species of Bullfrog from Florida and the Gulf Coast, by Leonhard Stejneger	211
levior, new species	892	New Species of Snakes, Two, Descriptions of, with an Annotated List of Batrachians and Reptiles Col- lected in the Vicinity of La Guaira, Venezuela, by Leonhard Stejneger	179
ovifer, new species	892	Unfigured, or Imperfectly Known Shells, Chiefly American, in the U. S. National Museum, Illustra- tions and Descriptions of, by Wil- liam Healey Dall	499
Needle puffer	257	Newly Found Meteorite from Admire, Lyon County, Kansas, A, by George P. Merrill	907
Neneba	698	Nicobar and Andaman Islands, the Mam- mals of the, by Gerrit S. Miller, jr.	751
prasina	698	Niconiades merenda	439
Nengio	584	merendula, new species	439
Neoditrema	354, 355	Nigrita dialolicus	669
ransonneti	355, 356	Nishikiuwo	646
Neolesbia	698	Nomenus	42
Neoliparis	351	North America, Descriptions of New Deca- pod Crustaceans from the West Coast of, by Mary J. Rathbun	885
mucosus	351	Notophoyx	699
Neopercis	463, 466, 469, 496	Notototheniidae	462, 496
aurantiaca	467, 468, 496	Novacula dea	654
multifasciata	467, 468, 496	Numenius minutus	695
ramsayi	466	Numida	668
sexfasciata	467, 468, 496	Nuthatch	915
Neophema	698	Nyctalatinus	700
Neotis	699	albipunctatus	700
Nephila plumipes	221	Nyctale harrisi	700
wilderi	221	Nycticejus temminckii	778
Neptunea	520, 521, 536	Nycticorax	700
badia	529	infustus	700
behringi	530	Nyctimene	700
behringi	528	Nymphalidae	383
castanea	529	Nymphalinae	392
harpa	522	Nyroca	690
terebialis	526	Oberholser, Harry C., on A Review of the Larks of the Ge- nus Otocoris	801
Neptunella	520	on Catalogue of a Collection of Hummingbirds from Ecuador and Colombia	809
Nerka	575	Obispos	336
Nerophis	6	Observatory sculpin	475
Nesacanthus	699	Ocinebra	533, 535, 539
Neshyphantes	699	poussoni	287
Nesierax	699	Ocreatus cissurus	332
Nesillas	699	melanantherus	321, 331
Nesochen	699	Ocypeta	690
Nesocites	699	Ocypetes	690
Nesocnas	699	Odocoileus	161
Nesolimnas	699	Odontamblyopus rubicundus	128
Nesomimus	699	Odontobutis	35, 42, 130
Nesotricus	699	obscurus	42, 43, 130
ridgwayi	699	Odontophorus spodiopetetus	713
Nettalopex	699	Edicnemida	726
New American Butterflies, Descriptions of, by William Schaus	383	Enoenas	700
New Birds from the Southern United States, Descriptions of Three, by Edgar A. Mearns	915	Enolimnas	700
New Chilopod from Utah, a, Henicops Dolichopus, by Ralph V. Cham- berlin	797	Enopopelia	700
New Decapod Crustaceans from the West Coast of North America, Descrip- tions of, by Mary J. Rathbun	885		
New Diptera from Southern Africa, by D. W. Coquillett	27		
New Genus of Ostreiform Mollusks from the Cretaceous, Chondrodonta, a, with Descriptions of the Genotype and a New Species, by Timothy W. Stanton	301		
New Species, Descriptions of, with a Re- view of the American Moths of the Genus Depressaria Haworth, by August Busck	731		
New Species of Algae of the Genus Buto- trephes, Two, from the Upper Silu- rian of Indiana, by David White ..	265		

	Page.		Page.
Oeonus garima, new species	445	Ornismia torquata	325
Off shore kisugo	468	Ornismya	666, 721
surfi-fish	355	alinae	331
Ogcocephalidae	362, 377, 381	cinnamomea	666
Ogcocephalinae	378	clarisse	666
Ogcocephalus	373	delphinæ	319
Ohagurobera	623	dumerillii	317
Oily-fish	599	eximia	666
Okigisu	468	fanny	340
Olios antiquensis	223	felicianæ	318
antillanus	223	glionata	721
On a Stony Meteorite, which Fell Near		lumachella	666
Felix, Perry County, Alabama, May 15,		maniculata	721
1900, by George P. Merrill	193	microrhyncha	335
Oncorhynchus	568, 569, 574, 579, 593	mulsanti	341
chouicha	570	cenone	317
gorbuscha	569, 571	pennata	721
haberi	572	temminckii	328
keta	570, 571, 572, 593	vestita	721
kisutch	570, 571, 572, 574, 593	vestita femina	721
lagocephalus	572	Ornismya	691, 697
lycaodon	574, 575	cupripennis	697
masow	570, 571, 572, 573, 593	heteropogon	697
nerka	569, 570, 571, 575, 593	iris	697
kennerlyi	575, 577	kingii	336
orientalis	570	microrhyncha	697
paucidens	575	parzudaki	697
perryi	574	phebe	697
proteus	569	rhami	697
quinnat	570	Ornithodesmus	701
sanguinolentus	574	cluniceus	701
scouleri	568, 569	Ornithopus	663
tschawytseha	569, 570, 571, 573, 574	Oronertus	701
tsuppitch	574	Orpheus melanotis	699
yessoensis	571, 572	Ortalix ruficauda	165
Oncyhornis	700	Orthagoriscus	260
Oonidus	249	nalis	261
Ophidioid	461	fasciatus	261
Ophryornis	700	mola	260
Ophryoesa	182	spinosus	261
Ophthalmolepis	641	Orthocnemus	689, 701
Ophthalmolepis lineolata	641	gallicus	701
Opisthistius tahmel	607	Ortholophus	701
Opisthodactylus	700	Orthorhynchus amethysticollis	333
patagonicus	700	estellæ	665
Opisthognathide	462, 491, 497	Orthrageriscus	260
Opisthognathus	492	alexandrini	261
Opisthopora euryptera	336	battaræ	261
Oplophoridae	904	blochii	261
Opuntia	136	elegans	261
Orania	539	ghini	261
Orbidus	231	hispidus	261
Oregonia	885	lunaris	261
bifurca, new species	885	mola	260
Orejas de fuego	339	oculeatus	261
Oreoctistes	700	ozodura	261
leucops	700	redi	261
Oreospiza	700, 701	retzii	261
fuliginosa	700	rondeletii	261
Oreostruthus	700, 701	solaris	261
Oreotrochilus chimborazo	322	Orthragus	260
jamesonii	322	luna	260
jamesonii	322	mola	260
Original hera	638	Ortygonax	701
Ornanites	198	Ortygops	701
Ornatipitta	701	Ortyx thoracicus	676
Ornismia paradisæa	329	Oryzivora	701

	Page.		Page.
<i>Oryzivora leucotis</i>	701	<i>Otocoris alpestris chrysolama</i>	807, 830, 831, 841, 842, 843, 844, 845, 846, 847, 848, 849, 851, 853, 855, 857, 862
<i>Oryzomys magdalinae</i>	142, 143	<i>diaphora</i> , new subspe-	
<i>medius</i> , new species.....	142, 143	<i>cies</i>	806, 829, 830, 831, 832, 844, 845
<i>mollipilosus</i>	142, 143	<i>enthymia</i> , new subspe-	
<i>Oscuros</i>	330	<i>cies</i>	807, 817, 819, 820, 823, 827, 830, 865
<i>Osmeris</i>	586	<i>flava</i>	807, 810, 812, 866, 867, 868, 879
<i>eperlanus</i>	586	<i>giraudi</i>	806, 819, 821, 830, 831, 832, 833, 844
<i>Osmerus</i>	586, 593	<i>hoyti</i>	806, 809, 812, 813, 814, 815, 816, 817, 819, 822, 827, 832, 834, 838
<i>dentex</i>	587, 593	<i>insularis</i>	806, 839, 840, 841, 843, 852
<i>eperlanus</i>	587	<i>leucansiptila</i> , new sub-	
<i>japonicus</i>	589	<i>species</i>	806, 823, 824, 860, 862, 864, 865, 866
<i>olidus</i>	588, 589	<i>leucolama</i>	807, 812, 814, 815, 816, 817, 819, 820, 822, 823, 824, 825, 827, 830, 832, 833, 834, 835, 836, 850, 851, 857, 858, 862, 865
<i>oligodon</i>	589	<i>merrilli</i>	807, 817, 822, 823, 830, 833, 834, 835, 836, 837, 838, 840, 843, 847, 858
<i>Oso hormiguero</i>	161	<i>oaxaca</i>	806, 822, 830, 842, 844, 847, 850, 853, 854, 855, 856, 857, 859, 862
<i>Osorokoma</i>	582	<i>occidentalis</i>	806, 823, 824, 830, 850, 855, 857, 858, 860, 862, 864, 865
<i>Osteornis</i>	701	<i>pallida</i>	806, 845, 848, 854, 855, 862, 863, 864, 865
<i>ardeaceus</i>	701	<i>peregrina</i>	806, 841, 842
<i>Ostiaris</i>	701	<i>praticola</i>	807, 808, 809, 819, 821, 822, 823, 825, 827, 828, 829, 830, 832, 833, 834, 835, 836, 838
<i>Ostinops decumanus</i>	175	<i>rubea</i>	806, 836, 847, 848, 851, 852, 853, 854, 859
<i>oleagineus</i>	175	<i>strigata</i>	806, 835, 836, 837, 838, 839, 840, 841, 843, 847, 852, 843
<i>Ostracion boops</i>	261	<i>var. peregrina</i>	841
<i>catheoplateus subrotundus</i>	260	<i>ammophila</i>	806, 807, 881, 883
<i>oblongus holacanthus</i>	257	<i>aphrasta</i>	806, 881, 883
<i>Ostrea</i>	301, 303	<i>articola</i>	806, 881, 882
<i>aff. munsoni</i>	302, 305	<i>argalea</i>	806, 882, 883
<i>joanna</i>	301, 302, 304, 305	<i>atlas</i>	806, 811, 866, 881, 883
<i>munsoni</i>	301, 302, 303, 304, 305	<i>balcanica</i>	805, 882, 883
<i>nunsoni</i>	305	<i>berlepschi</i>	805, 876, 879, 882, 883
<i>virgata</i>	306	<i>bicornis</i>	805, 882, 883
<i>Ostreiform mollusks from the Cretaceous,</i> <i>a new genus of</i>	301	<i>bilopha</i>	806, 873, 874, 879, 880, 882, 883
<i>Othyphantes</i>	702	<i>chrysolama</i>	807, 881, 883
<i>Otididae</i>	726	<i>diaphora</i>	806, 881, 882
<i>Otis bengalensis</i>	688	<i>diluta</i>	806, 882, 883
<i>ludwigii</i>	699	<i>elwesi</i>	806, 866, 867, 868, 869, 870, 871, 873, 882, 883
<i>vigorsi</i>	687	<i>enthymia</i>	807, 881, 882
<i>Otocoris</i>	834, 805, 811, 823, 824, 842, 848, 853, 865, 866, 869, 880	<i>flava</i>	807, 881, 882
<i>a Review of the Larks of the Ge-</i> <i>nus, by Harry C. Oberholser</i>	801	<i>giraudi</i>	806, 881, 882
<i>actia</i>	806, 881, 883	<i>hoyti</i>	806, 881, 882
<i>adusta</i>	806, 881, 883	<i>insularis</i>	806, 881, 882
<i>albigula</i>	872, 874, 875	<i>larvata</i>	874, 875, 676
<i>alpestris</i>	805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 817, 819, 822, 827, 832, 834, 838, 846, 857, 860, 866, 867, 868, 873, 876, 880, 881, 882	<i>leucansiptila</i>	806, 881, 883
<i>actia</i> , new subspecies ..	806, 822, 830, 836, 838, 840, 841, 844, 845, 847, 848, 850, 851, 852, 853, 855, 857, 859, 862, 865		
<i>adusta</i>	806, 822, 830, 848, 850, 855, 857, 858, 859, 860, 862, 864, 865		
<i>alpestris</i>	806, 807, 809, 810, 811, 812, 813, 814, 819, 822, 827, 832, 834, 838, 857, 860, 867, 868, 870		
<i>ammophila</i> , new sub-			
<i>species</i>	806, 807, 823, 830, 848, 849, 851, 855, 862, 864, 865		
<i>aphrasta</i> , new subspe-			
<i>cies</i>	806, 820, 830, 844, 845, 858, 860, 862, 863		
<i>articola</i> , new subspe-			
<i>cies</i>	806, 813, 814, 815, 816, 817, 819, 821, 827, 832, 833, 834		
<i>arenicola</i> ..	820, 823, 849, 851, 857		

	Page.		Page.
Otocoris leucolæma	807, 881, 882	Otocoryx	805
longirostris	806,	Ovoide fascé	249
811, 866, 867, 868, 869, 870,		Ovoides	249, 250, 264
871, 873, 874, 876, 882, 883		latifrons	253, 254
argalea, new subspe-		ophryas	253, 254
cies	806, 870, 871, 872	Ovum	249
elwesi	806,	commersoni	249
867, 868, 869, 870, 871, 873		Owenornis	702
longirostris	806, 811, 867,	affinis	702
868, 869, 870, 871, 873, 874, 876		Oxybelis acuminatus	191
perissa, new subspe-		Oxycheilinus	653
cies	806, 869, 870, 871, 873	arenatus	653
sibirica	806,	Oxymetopontinae	34
871, 872, 873, 875		Oxyopes	224
merrilli	807, 881, 882	gracilis	224
oaxacæ	806, 881, 883	salticus	224
occidentalis	806,	Oxyopidæ	224
823, 824, 830, 850, 855, 857,		Oxypelia	702
858, 860, 864, 865, 881, 883		Oxyptera	672
oreodrama	806, 882, 883	Oxyrhopus	187
pallida	806, 881, 883	doliatus	188
penicillata	805, 811, 866, 867, 870, 872, 874,	semicinctus	189
875, 876, 877, 878, 879, 882, 883		Oxyura	707
balcanica	805, 875, 876	Oxyurus	668
bicornis	805, 877, 878, 879	Oyabitsuchiya	608
diluta	806, 877, 878	Ozodura	260
oreodrama, new sub-		mola	260
species	806, 876, 877, 878	orsini	260, 261
penicillata	805, 811, 867, 870,	Pachycephalixus	702
874, 875, 876, 877, 878, 879, 880		Pachyornis	702
peregrina	806, 881, 883	Pachyphantes	702
perissa	806, 882, 883	Pachyrhampus albinucha	709, 721
praticola	807, 881, 882	Pachysoma giganteum	786, 787, 795
rubea	806, 881, 883	scherzeri	788, 795
scriba	874, 875	Pachyura murina	777
sibirica	806, 882, 883	Padraona calcarea, new species	454
strigata	806, 881, 882	radiata, new species	455
teleschowii	870	sartia, new species	454
Otocornis	805	Pagodula	534, 539, 540
Otocorys	805	Palæmonetes kadiakensis, new species	903
albigula	872	Palæmonidæ	903
alpestris	807, 810	Palæo-casuarius	702
arenicola	820, 823, 833, 855	Palæociconia	702
chrysolæma	842	australis	702
giraudi	831	Palæocolymbus	702
leucolæma	812, 816	barretti	702
praticola	825	Palæocorax	702
rubeus	845, 851	Palæocryptonyx	702
strigata	837	donnezani	702
atlas	866	Palæogrus	702
berlepschi	879	princeps	702
bilopha	873	Palæolimnas	703
brandti	872, 873	Palæopelargus	703
diluta	876, 877, 378	nobilis	703
elwesi	868, 873	Palæospheniscus	703
longirostris	867, 869, 873, 874, 876	antarcticus	703, 704
nigrifrons	868, 869	patagonicus	703
pallida	876, 877	Palæotetrix	703
parvexi	872, 873	gilli	703
penicillata	874, 875, 876, 877, 878, 879	Palaëtus	703
iranica	874	rapax	703
transcaspica	874	Palamopus	663
var bicornis	878	Pallasia	260
peregrina	841	pallasi	260, 261
petrophila	873	Pallasicarbo	703
sibirica	872, 873	Pallida	172
teleschowii	868, 869	Palmeria	703

	Page.		Page.
<i>Palmeria mirabilis</i>	703	<i>Parapercis hexophthalma</i>	463, 466, 496
<i>Palo blanco</i>	330	<i>multifasciata</i>	468
<i>Paludestrina</i>	272, 275, 276, 277, 279, 287	<i>ommatura</i> , new species	463, 465, 496
<i>longinqua</i>	279, 284, 285, 287	<i>pulchella</i>	463, 466, 496
<i>protea</i>	284,	<i>ramsayi</i>	466
285, 298, 277, 279, 280, 282, 283		<i>sexfasciatus</i>	467
<i>Paludestrinae</i>	274, 275, 294	<i>Parapomacentrus</i>	600
<i>Palumbæna</i>	674	<i>polynema</i>	600
<i>Palumbis</i>	703	<i>Paraptenodytes</i>	703, 704
<i>Pan</i>	703, 715	<i>Pardaliparus</i>	704
<i>Pandalidæ</i>	900	<i>Pardosa porto-ricensis</i> , new species	224
<i>Pandalopsis aleutica</i> , new species	901, 902	<i>Paridæ</i>	726
<i>ampla</i>	901	<i>Parnopio</i>	704
<i>dispar</i> , new species	902	<i>Parra africana</i>	706
<i>lamelligera</i>	901	<i>variabilis</i>	668
<i>longirostris</i> , new species	902	<i>Parrot fishes</i>	656
<i>Pandalus borealis</i>	900	<i>Parus caudatus</i>	670
<i>danae</i>	901	<i>elegans</i>	704
<i>jordani</i> , new species	901	<i>pendulinus</i>	712
<i>montagui</i>	901	<i>Paryphophorus</i>	704
<i>tridens</i> , new sub-		<i>Pasiphaea acutifrons</i>	905
species	901	<i>affinis</i> , new species	905
<i>stenolepis</i> , new species	901	<i>corteziana</i> , new species	905
<i>Pandora bushiana</i>	511, 563	<i>emarginata</i> , new species	905
<i>gouldiana</i>	511, 564	<i>faxonii</i>	905
<i>trilineata</i>	511, 563	<i>pacifica</i> , new species	905
<i>Panomya ampla</i>	560, 565	<i>Pasiphaeidae</i>	904
<i>Panopea norvegica</i>	560	<i>Pastor</i>	704
<i>Panopea generosa</i>	560, 565	<i>fuscus</i>	665
<i>globosa</i>	560, 565	<i>Patagona gigas</i>	315, 316, 321
<i>Panychlora stenura</i>	318	<i>Patagonis</i>	704
<i>Papias etyanus</i> , new species	447	<i>marshi</i>	704
<i>sobrinus</i> , new species	448	<i>Patella alternata</i>	501
<i>tristissimus</i> , new species	447	<i>Patulastra pugetensis</i>	500
<i>Papilio socama</i> , new species	424	<i>Pecho blanco</i>	323
<i>Papilionidæ</i>	423	<i>cafe</i>	328
<i>Papilioninæ</i>	424	<i>Pecten davidsoni</i>	559, 565
<i>Parachæturichthys</i>	36, 103, 131	<i>gibbus</i> , var. <i>ampliocostatus</i>	507, 564
<i>polynemus</i>	103, 131	<i>randolphi</i>	559, 565
<i>Paradiodon</i>	256	<i>Pectinidæ</i>	302
<i>hystrix</i>	256	<i>Pecuarinus</i>	704
<i>quadrimaculatus</i>	257	<i>Pedalion</i>	260
<i>Paradisea quillfeldi</i>	719	<i>Pedicularia californica</i>	550, 565
<i>Paradiscide</i>	726	<i>Pediculate Fishes</i> , or <i>Anglers of Japan</i> , a	
<i>Paradoxornis</i>	667	<i>Review of the</i> , by David Starr Jordan	
<i>ruficeps</i>	714	<i>assisted by Michitaro Sindo</i>	361
<i>Paradoxurus</i>	772	<i>Pediculati</i>	361, 362
<i>grayi</i>	773, 793	<i>Pedilorhynchus</i>	704
<i>musanga</i>	772, 794	<i>stuhlmanni</i>	704
<i>typus</i>	772	<i>Pegasidæ</i>	1, 2, 19
<i>tytleri</i>	772, 792, 793, 794, 795	<i>Pegasus</i>	2
<i>Paraglyphidodon</i>	605	<i>draconis</i>	2
<i>bonang</i>	605, 606	<i>volitans</i>	2
<i>Paragobius</i>	72	<i>Pelagornis</i>	681, 704
<i>Parajulis</i>	636	<i>barretti</i>	704
<i>pœcilopterus</i>	636	<i>Pelargocrex</i>	704
<i>Paraliparis</i>	348	<i>Pelargodes</i>	701
<i>Paramythia</i>	703	<i>Pelargopappus</i>	704, 705
<i>montium</i>	703	<i>Pelargopsis</i>	704, 705
<i>Paramythiidae</i>	703, 726	<i>magna</i>	705
<i>Parapasiphae gilesii</i>	904	<i>Pelasia</i>	705
<i>serrata</i> , new species	904	<i>Pelecanidae</i>	164, 726
<i>Parapegasus</i>	2	<i>Pelecanus carbo</i>	688
<i>natans</i>	2	<i>graculus</i>	685
<i>Parapercis</i>	463, 466, 467, 469, 496	<i>occidentalis</i>	164
<i>aurantiaca</i>	468	<i>Pelecyornis</i>	705, 710
<i>cylindrica</i>	463	<i>Pelecypoda</i>	558

	Page.		Page.
Pellicia bipuncta, new species	430	Phalangium palmatum	226
capitans, new species	430	Phalcobænus	701
costimacula	430	Phanerodon	354
macareus	430	Phanis cumbre, new species	445
vecina, new species	430	tavola, new species	445
Peltohyas	705	Pharyngognathi	353
Penæidæ	887	Phasianidæ	726
Penthetriopsis	705	Phasianus erythrophthalmus	688
Peramys brevicaudatus	138	meleagris	684
Perca louti	607	Phassa	706
polymna	598	Phemiades jamaicensis, new species	440
Perciform fishes of diverse affinities	497	Philammus	805
Percis	463	Philander philander	138
caudimaculata	466	Phileremos	805
hexophthalma	466	alpestris	879
maculatus	463	bicornis	878, 879
multifasciata	468	rufescens	810, 812, 879
polyophthalma	466	striatus	810, 812
pulchella	463	Phileremus	805
sexfasciata	467	Philobrya	507
Percoid	461	atlantica	507, 564
Percoidæ	353, 461	Philomela	706
Perichares triplaga, new species	460	Phlebodes chittara, new species	444
Periophthalminæ	35	fartuga, new species	445
Periophthalmodon schlosseri	49	gulala, new species	444
Periophthalmus	35, 47, 49, 130	metonidia, new species	444
cantonensis	49, 130	Phlexis	676
kœlreuteri, var. modestus	49	Phlogœnas hoedti	666
modestus	49	Phœnicophæus erythrognathus	720
papilio	49	Phœnicopteridæ	726
Periploma	510	Phœnicurus	706
Perissocephalus	671, 705	ruficilla	706
Perissornis	705	Phoethornis	312
Perissospiza	705	amaura	314
Peristera	674	griseogularis	313, 314
cyanopis	702	hispidus	313
Peristeridæ	166, 726	longirostris	312, 313
Peropteryx canina	158, 159	baroni	312, 313
kappleri	158, 159, 160	bolivianus	313
Perroquet gris	690	longirostris	312, 313
Petasophora	321	mexicanus	312, 313
iolata	320, 321	susurrus	313
Petronason	658	striigularis	314
psittacus	658	atrimentalis	313
Phacelias	705	syrrnatophorus	313
Phædrus	705	berlepschi	313
Phæolæma cervinigularis	323	yaruqui	312, 313
Phæospiza	705	Pholcidæ	219
thomensis	705	Pholcus convexus	219
Phæthontidæ	726	Pholia	706
Phæthornis	172	hirundinea	706
atrimentalis	313, 314	Pholidornis rubrifrons	713
augusti	172	Phororhacidæ	728
baroni	312	Phororhacis	706
berlepschi	313	Phororhacos	706
griseogularis	313	Phorusrhacos	706
supercilliosus	172	longissimus	706
yaruqui	312	Phrynida	226
Phæetornis hispidus	313	Phrynonax guentheri	186
Phaiolaima æquatorialis	323, 324	lyoni, new species	185, 186
cervinigularis	309, 323, 324	Phrynus palmatus	226
rubinoides	323, 324	Phyciodes brancodia, new species	394
Phalacrocoracidæ	726	carigia, new species	395
Phalacrocorax	703	fellula, new species	393
harrisi	698	ianthe	393
perspicillatus	703	orticas, new species	394
Phalangida	226	sejona, new species	393

	Page.		Page.
Phyciodes tulcis.....	394	Pipistrellus tenuis.....	792, 795
Phyllobates trinitatis.....	179	tickelli.....	779, 792, 793
Phyllopezus.....	664, 706	Pipra albifrons.....	694
Phyllorhina bicolor.....	781, 793, 794	Pipridæ.....	173, 727
nicobarensis.....	781, 793, 794	Piranga ardens.....	176
Phyllostoma hastatum.....	152	Pirgos.....	535, 542
Physa. 275, 279, 287, 288, 290, 291, 292, 293, 294, 295, 299		Pisynolimnas.....	707
alata.....	289	Pitangus derbianus rufipennis.....	173
ampullacea.....	289, 293, 299	Pithecophaga.....	707
ancillaria.....	299	jefferyi.....	707
aurantia.....	288	Pitta.....	684, 690, 697, 701, 711
aurea.....	292	arguata.....	697
carltoni.....	291, 292	cucullata.....	684
costata.....	290	elliotti.....	690
diaphana.....	289	iris.....	711
distinguenda.....	289	Pittasoma.....	671
elliptica.....	288	Pittidiæ.....	727
gabbi.....	289, 299	Plagiostenium gibbus var. ampliocostatus.....	507, 564
gyrina.....	288, 292, 293, 294, 299	Plagiospiza.....	707
var. elliptica.....	293	Planetis.....	679
heterostropha.....	288, 292, 294, 299	Planorbes.....	296
humerosa.....	287, 289, 293, 294, 295, 299	Planorbis.....	279, 287, 296
lordi.....	289, 290, 294, 299	ammon.....	287, 296
malleata.....	291	gracilentus.....	287
mexicana.....	289, 290, 294, 299	liebmann.....	287
nitens.....	289, 299	trivolvus.....	296
obesa.....	299	Plataleide.....	727
osculans.....	289, 299	Plataneros negros.....	321
philippii.....	290	Platycephalus sihamus.....	486
plicata.....	290, 291	PlatyGLOSSUS.....	635, 636
solida.....	290	bleekeri.....	638
vinosa.....	290	marginatus.....	636
virgata.....	289, 294, 299	pocilopterus.....	637
virginea.....	289, 294, 299	pyrrhogramma.....	637
Physidæ.....	288, 290, 299	tenuispinis.....	638
Physogaster.....	232	trimaiculatus.....	635
lunaris.....	232	Platygobius macrorhynchus.....	84
Physornis.....	706	Platypterna.....	663
fortis.....	706	Platyrhynchus mystaceus insularis.....	174
Playa cayana thermophila.....	170	Plecoglossinæ.....	568
Pichinchanos.....	331	Plecoglossus.....	568, 584, 593
Picidæ.....	171, 726, 727	altivelis.....	584, 593
Pico curvo.....	314	Plectana linnæi.....	222
de Lloa.....	327	sexserata.....	222
largo.....	327	Plectognathus.....	229
Piculus.....	663, 706	Plectorhynchus gaterina.....	607
Picumnus.....	171	Plectroperdix.....	707
micromegus.....	699	Plectropus.....	663
Picus flavus.....	676	Plectrura.....	707
minor.....	706	Plesiops.....	490
noguchii.....	714	Pleurotoma.....	513
tridactylus.....	680	callicesta, new species.....	515
Pierinæ.....	423	circinata.....	515, 564
Pieris sublineata, new species.....	423	insignis.....	515
Pimelometopon.....	621	perversa.....	513, 564
Pinarolæma buckleyi.....	320	piona, new species.....	514
Pinna ostreaformis.....	305	santarosana, new species.....	515
Pinon.....	535	thalea, new species.....	514
Pionites.....	706	vinosa.....	514, 564
Pipile.....	676	Plexippus paykulli.....	224
Pipilo.....	676	Plica plica.....	182
Pipistrellus.....	779	Plicifusus.....	523
abramus.....	779, 780, 793	brunneus.....	525, 564
camortæ, new species.....	779, 780, 792	herendeeni, new species.....	527, 564
kuhli.....	779	martensi.....	526
nicobaricus.....	795	rectirostris.....	525, 564
pipistrellus.....	779	roseus.....	526, 564

	Page.		Page
<i>Plicifusus spitzbergensis</i>	526, 564	<i>Porzana castaneiceps</i>	667
<i>virens</i>	525, 564	<i>Porzanula</i>	708
<i>Ploceidæ</i>	727	<i>palmeri</i>	708
<i>Pluvianus cinerea</i>	696	<i>Potamocheilidon</i>	708
<i>Pluviorhynchus</i>	689	<i>Potamogeton</i>	267
<i>Podargidæ</i>	727	<i>Pratincola</i>	708
<i>Podargus papuensis</i>	676	<i>Prelado</i>	310
<i>Podica personata</i>	687	<i>Premnoplex</i>	708
<i>Poecilia fusca</i>	45	<i>Prenes diduca</i> , new species.....	439
<i>Poecilotreron</i>	707	<i>Priacanthus hamrur</i>	607
<i>Pogonias</i>	665	<i>Prilonotus</i>	254
<i>rolleti</i>	682	<i>rostratus</i>	254
<i>Pogonites</i>	707	<i>Priolepis</i>	40
<i>Pogonotricus</i>	173	<i>Prionirhynchus</i>	708
<i>Polemactus</i>	707	<i>Prionites gularis</i>	669
<i>Poliocephalus</i>	674	<i>Prionochilus vineens</i>	664
<i>Poliolimnas</i>	707	<i>Prionopidæ</i>	727
<i>Polionetta</i>	707	<i>Prionornis</i>	708
<i>Poliopsar</i>	707, 716	<i>Prister</i>	708
<i>Polioptila plumbeiceps</i>	178	<i>Pristiphomes</i>	607
<i>Polychrus marmoratus</i>	183	<i>Pristotis</i>	600
<i>Polyerata</i>	316	<i>cyanostigma</i>	600
<i>Polygyra ashmuni</i>	501	<i>fuscus</i>	604
<i>pseudodonta</i>	500	<i>violascens</i>	601
<i>rhysa</i>	500	<i>Procellariidæ</i>	727
<i>Polyplex gracilis</i>	543	<i>Prochilus</i>	596
<i>Polyteles alexandre</i>	715	<i>ephippium</i>	596
<i>Polyxemus bombus</i>	341	<i>Procionia</i>	708
<i>Pomacentridæ</i>	595, 606, 660	<i>lydekkeri</i>	708
<i>Pomacentrus</i>	596, 600, 602, 660	<i>Procyon</i>	162
<i>bankanensis</i>	604	<i>Proechimys gualaæ</i>	140
<i>biocellatus</i>	604	<i>mincæ</i>	140
<i>chrysurus</i>	604	<i>Progne chalybea</i>	176
<i>cœlestis</i>	601, 602, 660	<i>cryptoleuca</i>	918
<i>cyanomos</i>	602	<i>subis</i>	918, 919, 920, 922
<i>dorsalis</i>	604, 605	<i>subis floridana</i> , new subspecies.....	918, 922
<i>emarginatus</i>	604	<i>subis hesperia</i>	919, 921
<i>katunko</i>	604	<i>subis subis</i>	918, 920
<i>marginatus</i>	604	<i>Proherodius</i>	705
<i>melanocheir</i>	603	<i>oweni</i>	708
<i>pavo</i>	600	<i>Promecocephalus</i>	232
<i>punctatolineatus</i>	604	<i>(Promecocephalus)</i>	232
<i>rathbuni</i>	601, 602	<i>Promecocephalus</i>	232
<i>simsiang</i>	604	<i>argentatus</i>	232
<i>tanometopon</i>	604	<i>Proparus chrysæus</i>	692
<i>teniurus</i>	601, 602	<i>Propeamusium</i>	559
<i>trilineatus</i>	604, 605	<i>Propelargus</i>	708
<i>tripunctatus</i>	601, 604, 605, 660	<i>cayluxensis</i>	708
<i>vanicolensis</i>	604	<i>Prophaethon</i>	709
<i>violascens</i>	601, 602, 660	<i>shrubsolei</i>	709
<i>Pompholyx costata</i>	291	<i>Prosopietus</i>	709
<i>effusa</i>	293	<i>Prostheclina illustris</i>	225
<i>Pontonia californiensis</i> , new species.....	902	<i>signata</i> , new species.....	225
<i>Pontoniidæ</i>	902	<i>Protibis</i>	709
<i>Poospiza cæsar</i>	708	<i>cnemialis</i>	709
<i>Poospizopsis</i>	708	<i>Protorhæ</i>	709
<i>Popelairia popelairiei</i>	342	<i>Protornis</i>	709
<i>Popelairia conversi æquatorialis</i>	342	<i>glarniensis</i>	709
<i>conversii æquatorialis</i>	342	<i>Psalidoprymna gouldi</i>	337
<i>langsdorffi</i>	342	<i>gracilis</i>	337
<i>popelairii</i>	342	<i>victoriae</i>	337
<i>Popelaria langsdorffi</i>	342	<i>æquatorialis</i>	337
<i>Porcupine fishes</i>	256	<i>Psaltia</i>	709
<i>Porphyreicephalus</i>	708	<i>Pseliophorus</i>	709
<i>Porphyrio alleni</i>	690	<i>Psephis</i>	509
<i>cinereus</i>	707	<i>Pseudalaemon</i>	709
<i>Porphyriornis</i>	708	<i>Pseudamusium</i>	559
<i>comeri</i>	708	<i>dauidsoni</i>	559, 565

	Page.		Page.
<i>Pseudamysium randolphi</i>	559, 565	<i>Pteroclidæ</i>	727
<i>Pseudapteryx</i>	709	<i>Pteroclorus</i>	711
<i>gracilis</i>	709	<i>Pterogobius</i>	36, 88, 100, 131
<i>Pseudoboa</i>	188	<i>daimio</i> , new species.....	88,
<i>guerinii</i>	190	89, 90, 91, 92, 94, 131	
<i>neuwiedii</i>	189, 190	<i>elapoides</i>	88, 90, 92, 94, 131
<i>robinsoni</i> , new species.....	190	<i>virgo</i>	88, 94, 131
<i>Pseudochromidæ</i>	462, 490, 492, 497	<i>zacalles</i> , new species.....	88, 93, 131
<i>Pseudochromis</i>	491	<i>zonoleucus</i> , new species.....	88, 94, 131
<i>Pseudocoris</i>	641, 642	<i>Pteronetta</i>	711
<i>heteroptera</i>	641, 642	<i>Pteronotus</i>	532
<i>Pseudofringilla</i>	709, 710	<i>carpenteri</i>	532
<i>Pseudogeranus</i>	709	<i>Pteronymia calgria</i> , new species.....	385
<i>Pseudoglottis</i>	709	<i>carlia</i> , new species.....	385
<i>Pseudohyalina pugetensis</i>	500, 562, 563	<i>ilsia</i> , new species.....	385
<i>Pseudolabrus</i>	613, 625, 661	<i>minna</i> , new species.....	384
<i>eothisus</i>	626	<i>Pterophanes temminckii</i>	328
<i>gracilis</i>	625, 627, 661	<i>Pterophryne</i>	367, 368, 371, 381
<i>japonicus</i>	625, 661	<i>gibba</i>	371
<i>rubiginosus</i>	625	<i>histrio</i>	367, 368, 369, 371, 381
<i>Pseudolarus</i>	667, 709	<i>ramina</i>	367, 368, 369, 371, 381
<i>eoceanus</i>	709	<i>raninus</i>	368
<i>Pseudominla</i>	710, 715	<i>tumida</i>	369, 371
<i>Pseudomyobius</i>	710	<i>Pterophrynoides</i>	367
<i>annectens</i>	710	<i>histrio</i>	367
<i>Pseudoneptunea multangula</i>	505, 563	<i>Pterophrynus</i>	367
<i>multangulus</i>	505	<i>Pteropsaron</i> , new genus.....	469, 470, 496
<i>Pseudonestor</i>	710	<i>evolans</i> , new species.....	469,
<i>xanthophrys</i>	710	470, 471, 496	
<i>Pseudopomacentrus</i>	600	<i>verecundum</i> , new species..	470,
<i>littoralis</i>	600	472, 496	
<i>Pseudoscarus</i>	658	<i>Pteroptochidæ</i>	727
<i>aeruginosus</i>	659	<i>Pteropurpura carpenteri</i>	532, 564
<i>globiceps</i>	659	<i>petri</i>	532, 564
<i>microrhinos</i>	658	<i>Pteropus</i>	782, 783, 786, 795
<i>ovifrons</i>	659	<i>edulis</i>	782, 783, 786, 787, 793, 795
<i>schlegelii</i>	659	<i>faunulus</i> , new species.....	784,
<i>Pseudospingus</i>	710	785, 786, 787, 792	
<i>Pseudospiza</i>	710	<i>hypomelanus</i>	785
<i>Pseudosterna</i>	710	<i>javanicus</i>	783
<i>degener</i>	710	<i>lepidus</i>	785, 786
<i>Pseudostruthus</i>	710	<i>meduis</i>	785
<i>gongonensis</i>	710	<i>melanotus</i>	783
<i>Pseudotharrhaleus</i>	710	<i>nicobaricus</i>	782,
<i>caudatus</i>	710	783, 784, 785, 786, 787, 792, 793, 794, 795	
<i>Pseudototanus</i>	709	<i>vampyrus</i>	786, 787, 792, 795
<i>Pseuduria</i>	710	<i>Pterorhynchus</i>	532
<i>Psilomyzeta</i>	710	<i>Pterorhynchus</i>	467
<i>Psilonotus</i>	254	<i>Pteruthius rufiventris</i>	688
<i>rostratus</i>	254	<i>Pterygoceus</i>	711
<i>Psilopterus</i>	705, 710	<i>Pterygurex</i>	532
<i>communis</i>	710	<i>Ptilocorys</i>	711
<i>Psilopus</i>	701, 711	<i>Ptilolamius</i>	711
<i>Psiloscops</i>	711	<i>Ptilonorhynchidæ</i>	727
<i>Psittacidæ</i>	169, 727	<i>Ptiloprora</i>	711
<i>Psittacula</i>	169	<i>Ptilopus dohertyi</i>	696
<i>Psittacus</i>	690	<i>Ptilotis guisei</i>	711
<i>carolinensis</i>	675	<i>marchei</i>	674
<i>erythacus</i>	690	<i>Ptiloxena</i>	711
<i>lunulatus</i>	670	<i>Ptocas</i>	711
<i>placensis</i>	689	<i>Ptynx</i>	711
<i>pulchellus</i>	698	<i>Puffers</i>	231
<i>rodericanus</i>	698	<i>Puffinidae</i>	727
<i>Psittinus</i>	678	<i>Pulchripitta</i>	711
<i>Psoralia</i>	744	<i>Punanetta</i>	665
<i>Psychrolutes</i>	347	<i>Punctum pugetensis</i>	500
<i>Pteridophora</i>	711	<i>randolphii</i>	500, 562
<i>alberti</i>	711	<i>Purpura</i>	533, 535

	Page.		Page.
Purpureicephalus	708	Remiornis heberti	712
Putorius affinis	147	Remiza	712
Pycnonotidae	727	Reptiles and Batrachians Collected in the	
Pycnonotus flavescens	721	vicinity of La Guaira, Venezuela, with	
taivanus	717	Descriptions of Two New Species of	
Pycnorhamphus	705	Snakes, an Annotated List of, by Leon-	
Pygmornis longuemarei	172	hard Stejneger	179
Pyramidellidae	512, 533	Reptilia	181, 532
Pyramidula randolphii	500	Retusa mayoi	502, 563
Pyrgulopsis nevadensis	279, 280	Review of the American Moths of the	
Pyrgus	535	Genus Depressaria Ha-	
Pyrolofusus	522, 523	wortha, a, with Descrip-	
Pytelia monteiri	674	tions of New Species,	
Querquedula eatoni	677	by August Busck	781
hartlaubi	711	Atherine Fishes of Japan,	
Quinde cafe	328	a, by David Starr Jordan	
feo	330	and Edwin Chapin	
golondrina	316	Starks	199
mosca	340	Discobolous Fishes of Jap-	
negro	331	pan, a, by David Starr	
real	320	Jordan and John Otter-	
Quinnat salmon	570	bein Snyder	343
Quiscalus atroviolaceus	711	Gobioid Fishes of Japan,	
Radiolites	304	a, with Description of	
davidsoni	304	Twenty-one New Spec-	
Radix ampla var. utahensis	291	ies, by David Starr	
Radjah	685	Jordan and John Otter-	
Rain fish	582	bein Snyder	33
salmon	582	Gymnodont Fishes of Ja-	
Rallidae	727, 728	pan, a, by David Starr	
Rallina isabellina	700	Jordan and John Otter-	
Rallus australis	670	bein Snyder	229
concolor	666	Hypostomide and Lopho-	
cuvieri	680	branchiate Fishes of	
dieffenbachi	699	Japan, a, by David Starr	
monasa	691	Jordan and John Otter-	
plateni	668	bein Snyder	1
rytirhynchus	701	Japanese Species of Surfi-	
Ramphastidae	170, 728	fishes or Embiotocidae,	
Ramphiculus	706	a, by David Starr Jor-	
Ramphomicon microrhyncha	335	dan assisted by Michi-	
microrhynchum	335	taro Sindo	353
Rana catesbeiana	212, 213, 214	Labroid Fishes and Re-	
gryllo, new species	212, 213, 214	lated Forms Found in	
Ranzania	260, 262, 264	the Waters of Japan, a,	
makua	262, 263, 264	by David Starr Jordan	
truncata	263	and John Otterbein	
truncatus	262	Snyder	595
Rathbun, Mary J., on Descriptions of		Larks of the Genus Oto-	
New Decapod Crustaceans from the		coris, a, by Harry C.	
West Coast of North America	885	Oberholser	801
Rectirostrum	712	Pediculate Fishes or An-	
hypochondriacum	712	glers of Japan, a, by	
Recurvirostridae	728	David Starr Jordan as-	
Red bera	637	sisted by Michitaro	
-eyed puffer	255	Sindo	361
-fish	584	Salmonoid Fishes of Ja-	
kisugo	584	pan, a, by David Starr	
salmon	575, 577	Jordan and John Otter-	
shoe	380	bein Snyder	567
surf-fish	357, 359	Trachinoid Fishes and	
tiger-goby	468	Their Supposed Allies	
wedge fish	654	Found in the Waters of	
Redpole linnets	714	Japan, a, by David	
Regerhinus	169	Starr Jordan and John	
Reinwardtana	674	Otterbein Snyder	461
Remiornis	712	Rhabdochlamys	712

	Page.		Page.
Rhabdochlamys dejeani.....	712	Saba-fuku.....	234
Rhabdotorhinus.....	712	Saccolpteryx canina.....	159
Rhagoborus.....	712	kappleri.....	158
Rhagorhina.....	712	leptura.....	158, 160
Rhamphoteron.....	712	Sagamia, new genus.....	36, 100, 131
Rhaphidornis.....	712	russula, new species.....	100, 131
flavifrons.....	712	Sake.....	572, 573
Rhegma.....	490	Salangichthys.....	591
Rhimphalea.....	712	ariakensis.....	591
Rhinogobius similis.....	54, 56	microdon.....	591
Rhinolophus.....	781	Salangidæ.....	567, 591, 593
andamanensis.....	781, 792, 793, 794	Salanx.....	591, 593
Rhinomya.....	712	ariakensis.....	592, 593
Rhinornis.....	712	chinensis.....	591, 592
Rhinton bomax, new species.....	442	cuvieri.....	591
tanaris, new species.....	442	hyalocranius.....	591, 592
Rhodacanthis.....	713	microdon.....	591, 593
palmeri.....	713	Salar.....	577
Rhodinocichla rosea.....	177	ausonii.....	577
Rhodornis.....	713	fario.....	577
Rhodothraupis.....	713	Salicaria.....	709
Rhombura.....	713	Salmo.....	568, 569, 577, 579, 581, 593
Rhombus.....	520	arabatsch.....	575
Rhopocichla.....	713	argyreus.....	570
Rhynchortyx.....	713	blackistoni.....	580
Rhynchosimus.....	713	callaris.....	583
Rhynchospiza.....	713	canis.....	572
Rhynchotus.....	254	confluentus.....	570
peroni.....	254	consuetus.....	572
Rice-ball-fish.....	653	cooperi.....	575
Richmond, Charles W., on List of Generic Terms Proposed for Birds During the Years 1890 to 1900, Inclusive, to which are Added Names Omitted by Water- house in his "Index Generum Avium".....	663	curilus.....	582
Richmond, Charles W., and Wirt Robin- son, on An Annotated List of Birds Collected in the Vicinity of La Guaira, Venezuela.....	163	dermatinus.....	572
Rictaxis.....	512	erythrorhynchos.....	583
Ringicula.....	512	fario.....	577
Riparia.....	713	fariopsis.....	583, 584
europæa.....	713	gibber.....	569
River salmon.....	578	gorbuscha.....	569
Robinia.....	733	japonensis.....	572
pseudacacia.....	733	kennerlyi.....	575
Robinson, Wirt, and Charles W. Rich- mond, on An Annotated List of Birds Collected in the Vicinity of La Guaira, Venezuela.....	163	keta vel kayko.....	572
Robinson, Wirt, and Marcus W. Lyon, jr., on An Annotated List of Mammals Col- lected in the Vicinity of La Guaira, Venezuela.....	135	kisutch.....	574
Rockling.....	582	kundscha.....	582
Rocky Mountain nuthatch.....	923	kysutch.....	574
Roperia roperi.....	517, 564	lævigatus.....	583
Rostrornis.....	713	lagocephalus.....	572
floweri.....	713	leucomænis.....	582
Rothschildia.....	713	lycaodon.....	575
Rougetius.....	671	macrostoma.....	578, 579
Rubricapilla.....	714	malma.....	583
Rufibrenta.....	711	masow.....	571
Rufirallus.....	682	melampterus.....	575
Rupicola.....	714	milkschitch.....	574
Rupornis magnirostris.....	168	mykiss.....	579
Rustic wedge-fish.....	623	nerka.....	575
		nummifer.....	583
		olidus.....	588
		orientalis.....	570
		paucidens.....	575
		perryi.....	572, 574, 578, 579, 593
		pluvius.....	582, 584
		proteus.....	569
		quinnat.....	570
		richardi.....	575
		salar.....	577, 578, 580
		sanguinolentus.....	574
		scouleri.....	569, 574
		striatus.....	574

	Page.		Page.
<i>Salmo tapdisma</i>	575	<i>Schistes albogularis</i>	339
<i>tschawytscha</i>	570	<i>Schizopelma erichsonii</i>	218
<i>tschawytschiformis</i>	569	<i>Schizostoma megalotis</i>	153
<i>tsuppitch</i>	574	<i>Schoenichus megalotis</i>	714
<i>tudes</i>	583	<i>Schoür</i>	607
<i>warreni</i>	575	<i>mahsena</i>	607
Salmon family	567	<i>Sciæna malabarica</i>	486
Salmonidæ	567, 568, 586, 593	<i>Sciænide</i>	462, 485
Salmoninæ	568	<i>Sciurus æstuans hoffmanni</i>	145
Salmonoid Fishes of Japan, a Review of the, by David Starr Jordan and John Otterbein Snyder	567	<i>griscogena</i>	144, 145
<i>Saltator maxillosus</i>	716	<i>Selateria</i>	715
<i>olivaceus</i>	176	<i>Sclerocrangon alata</i> , new species	891
<i>Salvadorina</i>	714	<i>boreas</i>	891
<i>waigiuensis</i>	714	<i>Scolopacidæ</i>	164, 728
<i>Salvelini</i>	581	<i>Scolopax fedoa</i>	683
<i>alpinus</i>	581	<i>pygmæa</i>	683
<i>Salvelinus</i>	568, 580, 581, 593	<i>Scolopsis ghanam</i>	607
<i>alpinus</i>	581	<i>Scops flammeola</i>	711
<i>kundscha</i>	582, 593	<i>Scorpio americanus</i>	225
<i>malma</i>	583, 584, 593	<i>maculatus</i>	225
<i>parkii</i>	584	<i>Scorpionida</i>	225
<i>pluvius</i>	582, 584, 593	<i>Scotophilus</i>	778
Sand-fishes, the	482, 483	<i>temminckii</i>	778, 792
<i>Sanicula</i>	733	<i>Scototheres</i>	715
<i>marilandica</i>	745	<i>Scotothorus</i>	715
<i>Sapheopipo</i>	714	<i>Seyrornis</i>	715
<i>Sarcogeramis</i>	714	<i>Seytodes fusca</i>	218
<i>Sarcogyps</i>	714	<i>guyanensis</i>	218
<i>Sarganura</i>	714	<i>longipes</i>	218
<i>maculiceps</i>	714	<i>marmorata</i>	218
<i>Sarothrura</i>	714	<i>taczanowskii</i>	218
<i>Sasanoha</i>	625	<i>Seytodiæ</i>	218
<i>Satyrinæ</i>	387	Sea snails	347, 348
<i>Saucerotia edvardi</i>	316	Sea surf-fish	357
<i>edward</i>	316	<i>Seena</i>	708
<i>Sauropus</i>	663	<i>Selaginella lepidophylla</i>	501
<i>Sæorhynchus</i>	714	<i>Selenops insularis</i>	223
<i>Scala cochlea</i>	506, 563	<i>Semicossyphus</i>	612, 621, 661
<i>magnifica</i>	506	<i>reticulatus</i>	621, 623, 661
<i>mittelli</i>	506, 563	<i>robecchii</i>	621, 623
<i>nitidella</i>	505, 563	<i>Semioscopis packardella</i>	742
<i>retifera</i>	506, 563	<i>Semnopithecus</i>	794
<i>scipio</i>	506, 563	<i>Semnornis</i>	703, 715
<i>Scalaria cochlea</i>	506	<i>Serinopsis</i>	715
<i>Scanionis</i>	714	<i>Serranidæ</i>	462, 490
<i>lundgreni</i>	714	<i>Serrator</i>	715
<i>Scaphella ancilla</i>	517	<i>Setaria albigularis</i>	700
<i>junonia</i>	504	<i>Setogyps</i>	715
<i>stearnsii</i>	517, 564	Sharp-nosed puffers	254
<i>Scardafella</i>	696	Shells, Chiefly American, in the U. S. Na- tional Museum, Illustrations and Descriptions of New, Unfigured, or Imperfectly known, by Wil- liam Healey Dall	499
<i>Scaridæ</i>	595, 656, 662	of the Colorado Desert, the Fossil Fresh-water, their Distribution, Environment, and Variation, by Robert E. C. Stearns	271
<i>Scarinae</i>	656	<i>Shira-uwo</i>	591
<i>Scartelaos viridis</i>	47	<i>Shiwosabuku</i>	243, 244
<i>Scarus</i>	607, 656, 658, 662	Shore lark	857
<i>gallus</i>	647	<i>Sialia</i>	715
<i>globiceps</i>	658, 659, 662	<i>Sicydium</i>	113
<i>harid</i>	607	<i>obscurum</i>	113, 114
<i>lacerta</i>	659	<i>Sigmodon sanctemartæ</i>	142
<i>ovifrons</i>	658, 659, 662	<i>Sillaginidæ</i>	462, 485, 497
<i>psittacus</i>	658	<i>Sillago</i>	467, 485, 486, 497
<i>quinquefasciatus</i>	635	<i>acuta</i>	486
<i>Scenopeetes</i>	714, 718		
<i>Scenopeus</i>	714, 718		
Schaus, William, on Descriptions of New American Butterflies	383		

	Page.		Page.
<i>Sillago erythræa</i>	486	Snyder, John Otterbein, and David Starr	
<i>japonica</i>	486, 487, 497	Jordan, on A Review of the Labroid	
<i>malabarica</i>	486, 487	Fishes and Related Forms Found in the	
<i>parvisquamis</i>	486, 487, 497	Waters of Japan.....	595
<i>sihama</i>	486, 487, 497	Snyder, John Otterbein, and David Starr	
<i>Sillimanianus</i>	663	Jordan, on A Review of the Salmonoid	
<i>Silus</i>	590	Fishes of Japan.....	567
<i>silus</i>	590	Snyder, John Otterbein, and David Starr	
Silver puffer.....	234	Jordan, on A Review of the Trachinoid	
<i>salmon</i>	574	Fishes and Their Supposed Allies Found	
<i>Simulium nigrirarsis</i> , new species.....	27	in the Waters of Japan.....	461
Sindo, Michitaro, Assisting David Starr		<i>Solariella actinophora</i>	553
Jordan, on A Review of the Japanese		<i>carlotta</i> , new species.....	553
Species of Surf-fishes or Embiotocidæ.....	353	<i>Soldado</i>	341
Sindo, Michitaro, Assisting David Starr		<i>Solegnathus blochii</i>	11
Jordan, on A Review of the Pediculate		<i>Solenostoma cyanopterum</i>	4
Fishes or Anglers of Japan.....	361	<i>paradoxa</i>	4
Sipho.....	520, 521	<i>Solenostomidæ</i>	3, 19
<i>hallii</i>	525	<i>Solenostomus</i>	3, 19
<i>lividus</i>	526	<i>cyanopterus</i>	3, 4, 19
<i>martensi</i>	526	<i>paradoxus</i>	3, 4, 19
<i>terebialis</i>	526	<i>Solidago</i>	737
<i>Siphonaria alternata</i>	501, 502, 563	<i>Sparassidæ</i>	223
<i>brunnea</i>	501, 502	<i>Sparassus antiguensis</i>	223
<i>lineata</i>	501	<i>Sparisomatinae</i>	656
<i>lineolata</i>	501, 563	<i>Sparus anchorago</i>	616
<i>naufragum</i>	501	<i>fuliginosus</i>	635
<i>picta</i>	501, 502	<i>hardwickei</i>	648
<i>Siphonella</i>	520, 522	<i>malapteronotus</i>	635
<i>Siphonorbis</i>	520, 522, 523, 526	<i>meaco</i>	635
<i>Siphonostoma</i>	6	<i>mylius</i>	598
<i>Siphostoma</i>	6	<i>zonephorus</i>	635
<i>pelagicus</i>	6	<i>Spathopterus</i>	715
<i>schlegeli</i>	7	<i>Spathura cissura</i>	332
<i>Sirycter</i>	715	<i>melananthera</i>	331
<i>Sitta carolinensis</i>	923, 924, 926	Species of Algae of the Genus <i>Buthotre-</i>	
<i>aculeata</i>	923, 925, 926	<i>phis</i> , from the Upper Silurian of Indi-	
<i>atkinsi</i>	924	ana, Two New, by David White.....	265
<i>carolinensis</i>	924	Spectacle fish.....	476
<i>mexicana</i>	923, 926	Spermophilopsis.....	679, 716
<i>nelsoni</i> , new subspecies.....	923, 925	<i>Sphæroides</i>	231
<i>Sittasomus phelpsi</i>	174	<i>spengleri</i>	231
<i>Sittidæ</i>	728	<i>tuberculatus</i>	231
<i>Sittiparus</i>	710, 715	<i>Sphenæacus</i>	670
Sleek puffer.....	237	<i>Spheniscidæ</i>	728
Sleeper with head to north.....	255	<i>Spheroides</i>	231, 232, 250, 263, 607
Sloth.....	161	<i>abbotti</i> , new species.....	233,
Small marbled puffer.....	243	".....	240, 242, 243, 244, 249, 263
Smelts, the.....	586	<i>alboplumbeus</i>	233, 243, 244, 247, 263
Snakes, an Annotated List of Batrachians		<i>borealis</i> , new species.....	233,
and Reptiles Collected in the Vicinity of		".....	245, 246, 247, 263
La Guaira, Venezuela, with Descriptions		<i>chrysops</i>	233, 248, 264
of Two New Species of, by Leonhard		<i>exascurus</i> , new species.....	233, 241, 263
Stejneger.....	179	<i>inermis</i>	233, 237, 263
Snyder, John Otterbein, and David Starr		<i>laevigatus</i>	237
Jordan, on A Review of the Discobol-		<i>lunaris</i>	234
ous Fishes of Japan.....	343	<i>niphobles</i> , new species.....	233,
Snyder, John Otterbein, and David Starr		".....	244, 246, 248, 263
Jordan, on A Review of the Gobioid		<i>oblongus</i>	244
Fishes of Japan, with Descriptions of		<i>ocellatus</i>	233, 243, 263
Twenty-one New Species.....	33	<i>pardalis</i>	233, 239, 241, 249, 263
Snyder, John Otterbein, and David Starr		<i>porphyreus</i>	233, 237, 263
Jordan, on A Review of the Gym-		<i>richei</i>	233, 248, 264
nodont Fishes of Japan.....	229	<i>rubripes</i>	233, 236, 238, 239, 240, 263
Snyder, John Otterbein, and David Starr		<i>sceleratus</i>	232, 234, 263
Jordan, on A Review of the Hypos-		<i>spadiceus</i>	232, 234, 263
tomide and Lophobranchiate Fishes of		<i>spengleri</i>	231
Japan.....	1	<i>stictonotus</i>	232, 235, 241, 263

	Page.		Page.
<i>Spheroides tuberculatus</i>	231	<i>Staphylus terreus</i> , new species.....	433
tuberculé.....	231	Star-gazers, the.....	473
vermicularis.....	233, 244, 246, 263	Starks, Edwin Chapin, and David Starr	
xanthopterus.....	233, 239	Jordan, on A Review of the Atherine	
Spiders and Other Arachnida from Porto		Fishes of Japan.....	198
Rico, Some by Nathan Banks.....	217	Starry puffer.....	250
<i>Spiloptera</i>	680, 716	<i>Stasiasticus</i>	716
<i>Spilospiza</i>	716	montis.....	716
<i>Spirinchus</i>	586	Stearns, Robert E. C., on The Fossil	
thaleichthys.....	586	Fresh-water Shells of the Colorado	
<i>Spirontocaris</i>	893	Desert, their Distribution, Environ-	
arcuata, new species.....	893	ment, and Variation.....	271
bispinosa.....	894, 900	<i>Stegastes</i>	606
biunguis, new species.....	899	imbricatus.....	606
brachydactyla, new species.....	898	Stejneger, Leonhard, on An Annotated List	
camtschatica.....	899	of Batrachians	
cristata.....	899	and Reptiles Col-	
dalli, new species.....	894	lected in the Vi-	
decora, new species.....	896	cinity of La	
flexa, new species.....	896	Guaira, Venezu-	
gaimardii.....	897, 899	ela, with Descrip-	
belcheri.....	897	tions of Two New	
gracilis.....	896	Species of Snakes.	179
kincaidi, new species.....	899	on a New Species of	
liljeborgii.....	893	Bullfrog from	
macilenta.....	900	Florida and the	
macrophthalma, new		Gulf Coast.....	211
species.....	900	<i>Stelgidillas</i>	716
maxillipes, new species.....	898	<i>Stelgidostomus</i>	716
moseri, new species.....	897, 898	<i>Stenometopes</i>	232
murdochi, new species.....	893	(<i>Stenometopus</i>).....	232
ochotensis.....	894, 895	<i>Stenometopus</i>	232
polaris.....	895	testudineus.....	232
sica, new species.....	894	<i>Stenoradsia</i>	558
snyderi, new species.....	894	<i>Stenorhynchus</i>	671
spina.....	893, 894	<i>Stephanornis</i>	716
stoneyi, new species.....	899	<i>Stephanoxis</i>	716
townsendi, new species.....	897	<i>Stereornis</i>	716
tridens, new species.....	896	rollieri.....	716
truncata, new species.....	894	<i>Stereornithes</i>	710, 728
unalaskensis, new species.....	895	<i>Stereornithidæ</i>	728
vicina, new species.....	895	<i>Sterna anæthetus</i>	695
washingtoniana, new		tenuirostris.....	696
species.....	895	<i>Steropoides</i>	663
<i>Spizastur</i>	719	<i>Stethojulis</i>	613, 629, 661
<i>Spodiopsar</i>	707, 716	albovittata.....	631
<i>Spondylidæ</i>	302	interrupta.....	631
<i>Sporathraupis</i>	716	kalosoma.....	632
<i>Stachelloser Aufblaser aus Nagasaki</i>	244	phkadopleura.....	634
<i>Stalachtis satellites</i>	406	psacas, new species.....	629, 661
sonella, new species.....	406	renardi.....	630
stellidia, new species.....	406	strigiventer.....	629, 631, 661
<i>Stalix</i> , new genus.....	492, 495, 497	terina, new species.....	629, 631, 634, 661
histris, new species.....	495, 497	trossula, new species.....	629, 633, 661
Stanton, Timothy W., on Chondrodonta,		<i>Sticticarbo</i>	681
a New Genus of Ostreiform Mollusks		<i>Stictognathus</i>	717
from the Cretaceous, with Descriptions		<i>Stictolimnas</i>	717
of the Genotype and a New Species.....	301	sharpei.....	717
<i>Staphylornis</i>	716	<i>Stictoptera</i>	717
gallardoi.....	716	<i>Stictospiza</i>	717
<i>Staphylus alicus</i> , new species.....	433	<i>Stilbopsar</i>	717
anginus, new species.....	432	stuhmanni.....	717
ascalaphus.....	432	<i>Stiltia</i>	712
minor, new species.....	432	<i>Stizoptera</i>	717
scoramus, new species.....	432	<i>Stizorhina</i>	717
subapicatus, new species.....	433	<i>Strepomatidæ</i>	281
tadus, new species.....	432	<i>Strigidæ</i>	728

	Page.		Page.
String-fish	580	Syngnathus griseolineatus	7
Strix uralensis	711	koilomatodon	10
Strombella	521	ophidion	6
attenuata	529	pelagicus	6
beringi	528	schlegeli	6, 7, 19
castanea	529	serratus	9
regularis	529	tenuirostris	7
Strombus	521	tetragonus	11
norvegicus	523	typhle	6
pugilis	521	zanzibarensis	8
Sturnella magna meridionalis	673	Tachyornis	669, 717
Sturnidæ	728	hirundo	717
Sturnus sericeus	707	Tachyphonus cassini	696
Stygus	227	melaleucus	176
insulanus, new species	226	rubrifrons	687
Styphelus flavitarsis	227	tibialis	709
Styptes	717	Tænioides	37, 128, 132
Submarginula gigas	555	hermannianus	128
yatesi	555, 565	lacepedei	128, 132
Subula floridana	503	Tagelus	287
Sula	664	Tahhmel	607
Sulcosinus	524	tahmel	607
Sulidæ	728	Talpacotia	691
Surcula perversa	513	Tanago	353
Surf-fishes	353	Tanagra glaucocolpa	176
or Embiotocidæ, a Review of		Tanagridæ	176, 728
the Japanese Species of, by		Tanagroides	674
David Starr Jordan, assisted		Tantalops	717
by Michitaro Sindo	353	Tantalus leucocephalus	679
Surf smelts	588	loculator	717
Suruga	36, 96, 131	Taoperdix	717
fundicola, new species	96, 131	Taphaetus	717
Sus	752	Tapinopus	678, 718
andamanensis	752,	elliotti	718
754, 755, 756, 757, 792, 793, 794, 795		Tarantula aussereri	223
cristatus	754, 755, 756, 757	Tarentula fusa	223
natunensis	757	Tatoua lugubris	139
nicobaricus, new species	755, 756, 792	Tatua novemcincta	161
Suzumedai	599	Tantoga fasciata	634
Swallow tai	599	leucomos	635
Sweet perch	489	melapterus	634
sagi or smelt	588	mertensi	635
Swell-fishes	231	Tayassu tajacu	139
Sycobrotus reichenowi	702	torvus	139
Sylphidæna	707	Tchaviche	570, 571
Sylvia	706	Tectonornis	718
melanopogon	667	Teisu	654
rufa	719	Telegonus hurga, new species	427
Sylvicola	717	jancira, new species	427
Sylviidæ	178	Telemiades megalloides, new species	428
Symmachia eurina, new species	400	megallus	429
rubina	400	Telephonus minutus	670
satema, new species	400	Telespyza	718
temesa	400	cantans	718
Symmorphus	678	Temnurus	718
Synallaxis striatipectus	174	albicollis	718
Synechogobius	36, 102, 131	Temondai-okose	475
hasta	102, 131	Teratodes depressus	218
Syngnathidæ	3, 5, 6, 19	Terebra floridana	503, 563
Syngnathinæ	5	rushii	503, 563
Syngnathoides blochi	11	texana	502, 563
Syngnathus	5, 6, 8, 9, 19	Terebratalia hemphilli, new species	561, 565
acus	6	obsoleta	561
æquoreus	6	transversa	561
biaculeatus	11	Terekia	713
coarctatus	8, 9	Terenotreron	718
grayi	10	Terquemia	308

	Page.		Page.
<i>Terquemia forojuliensis</i>	302, 305	<i>Thalassoma verticale</i>	648
<i>Testudo denticulata</i>	192	<i>Thalassominae</i>	613
<i>Tetraganops</i>	715	<i>Thalliurus</i>	653
<i>Tetragnatha antilliana</i>	220	<i>Thalliurus blochi-chlorurus</i>	653
<i>argyra</i>	220	<i>Thalurania eriphile</i>	319
<i>laboriosa</i>	220	<i>fanny</i>	319
<i>protensa</i>	220	<i>fannyi</i>	319
<i>vicina</i>	220	<i>hypochlora</i>	318
<i>Tetragrathidæ</i>	220	<i>nigrofasciata</i>	319
<i>Tetragonops</i>	703	<i>Thamnocharis</i>	718
<i>Tetrao mexicana</i>	674	<i>Thamnophilus doliatus</i>	174
<i>pessieti</i>	717	<i>melanonotus</i>	174
<i>Tetraodon</i>	231, 249, 264	<i>Thanaos austerus</i> , new species	435
<i>aërostaticus</i>	250, 264	<i>Thaumantias fluviatilis</i>	316
<i>alboplumbeus</i>	243	<i>viridiceps</i>	316
<i>firmamentum</i>	250, 264	<i>Thecadactylus rapicauda</i>	181
<i>hispidus</i>	250, 251, 252, 264	<i>Thecla aratus</i>	417
<i>laterna</i>	252	<i>aritides</i> , new species	417
<i>lineatus</i>	249	<i>atrana</i> , new species	409
<i>meleagris</i>	250, 253, 254, 264	<i>bagrada</i>	422
<i>pœcilonotus</i>	244	<i>binangula</i> , new species	415, 416
<i>sceleratus</i>	234	<i>bolima</i> , new species	416
<i>stellatus</i>	249, 251	<i>brescia</i>	418
<i>Tetraodontidæ</i>	229, 230, 231, 232, 256, 263	<i>carla</i> , new species	408
<i>Tetraonidæ</i>	728	<i>chaluma</i> , new species	414
<i>Tetrodon</i>	232	<i>chilica</i> , new species	422
<i>aerostaticus</i>	251	<i>conoveria</i> , new species	413
<i>argentatus</i>	234	<i>curtira</i> , new species	413
<i>argyropleura</i>	234	<i>demea</i>	413
<i>bicolor</i>	234	<i>echinita</i> , new species	418
<i>chrysops</i>	248	<i>epopea</i>	412
<i>firmamentum</i>	250	<i>epopeoides</i> , new species	412
<i>grammatocephalus</i>	255, 256	<i>farmina</i> , new species	421
<i>hartlandi</i>	243	<i>fostera</i> , new species	421
<i>hispidus</i>	251, 252	<i>foyi</i> , new species	417
<i>implutus</i>	251	<i>gentilla</i> , new species	420
<i>inermis</i>	237	<i>giapor</i> , new species	407
<i>lunaris</i>	234	<i>guadala</i> , new species	418
<i>var. spadiceus</i>	234	<i>guzanta</i> , new species	420
<i>lune</i>	261	<i>hostis</i> , new species	420
<i>meleagris</i>	253	<i>humber</i> , new species	422
<i>mola</i>	260, 261	<i>illex</i> , new species	419
<i>niveatus</i>	243, 244	<i>kella</i>	423
<i>oblongus var. alboplumbeus</i>	243	<i>lanckena</i> , new species	422
<i>ocellatus</i>	243	<i>lebena</i>	413
<i>pardalis</i>	239	<i>malta</i> , new species	410
<i>perspicillaris</i>	251	<i>muatta</i>	415
<i>pœcilonotus</i>	243	<i>muattina</i> , new species	415
<i>porphyreus</i>	237	<i>normahal</i> , new species	410
<i>richei</i>	248	<i>nugar</i> , new species	408
<i>rivulatus</i>	255	<i>polama</i> , new species	416
<i>rubripes</i>	238	<i>polibetes</i>	417
<i>semistriatus</i>	252	<i>rana</i> , new species	414
<i>spadiceus</i>	234	<i>rickmani</i> , new species	411
<i>stellatus</i>	251	<i>tabena</i>	414
<i>stictonotus</i>	235	<i>talama</i> , new species	409
<i>vermicularis</i>	244	<i>taminella</i> , new species	414
<i>xanthopterus</i>	239	<i>tella</i> , new species	413
<i>Thalassoma</i>	613, 643, 645, 649, 662	<i>tephraus</i>	420
<i>cupido</i>	646, 662	<i>tigonia</i> , new species	419
<i>dorsale</i>	646, 648, 662	<i>vieca</i> , new species	411
<i>duperreyi</i>	648	<i>yomiba</i> , new species	410
<i>lunare</i>	648	<i>xorema</i> , new species	408
<i>lunaris</i>	648	<i>ziba</i>	419
<i>lutescens</i>	646, 647, 662	<i>zurkvitzi</i> , new species	412
<i>purpurea</i>	645	<i>Thegornis</i>	718
<i>quadricolor</i>	646	<i>musculosus</i>	718

	Page.		Page.
Theraphosidae	217	Trachinoid	461
Therapon yarbua	607	Fishes and Their Supposed	
Therecieryx	718	Allies Found in the Waters	
Theridiidae	219	of Japan, a Review of the,	
Theridium formidabilis	219	by David Starr Jordan and	
verecundum	219	John Otterbein Snyder	461
volatile	219	Trachinoidea	461, 462, 496
Thiellus	721	Trachinus gasteropelecus	483
Thinocoridae	728	trichodon	483
Thomisidae	222	Trachylæmus	719
Thomisus asperatus	222	Trachyradsia	558
Thoon lugens, new species	442	Trachyrhamphus	5, 8, 9, 19
Thouarsitron	718	cultrirostris	9
Thousand-needles	257	serratus	9, 20
Thracides bajula, new species	459	Transennella conradina	509, 563, 564
biserta, new species	460	Traversia	719
molion	460	lyalli	719
orusca, new species	459	Trematopsis	260
salius	459	mola	260
Threnetes cervinicauda	310	willughbei	260, 261
cervinicaudus	310	Treronidae	729
fraseri	310	Tretodon argenteus	234
ruckeri	310	Triænonphorichthys	113
Thringorhina	718	squamistrigatus	113, 114
Thryolegus	718	trigonocephalus	112
Thryothorus rutilus	177	Triænonphorus trigonocephalus	112
Thymele grenadensis, new species	427	Triænopogon	37, 111, 132
subvirescens, new species	426	barbatus	111, 132
Thymelicus bahiensis, new species	436	Triænopus	663
Thyoptera discifera	155	Trichocichla	719
Tiger-goby	467	rufa	719
kisugo	467	Trichodon	482, 483, 484, 485, 497
puffer	238, 258	japonicus	484
Tigriornis	718	lineatus	483
Tigrisoma	164, 717	stelleri	483
cabanisi	164, 687	trichodon	483, 497
lecolophum	718	Trichodontidae	462, 482, 497
salmoni	164	Tricholimnas	719
Tijerettas	332	Trichoparadisea	719
Tilapia	628	Trichotropis	551
Timaliidae	728, 729	Tridentiger	37, 112, 113, 132
Timeta	718	barbatus	111
Tinamidae	163, 729	bifasciatus	113, 117, 132
Titanornis	719	bucco, new species	113, 115, 116, 132
mirabilis	719	obscurus	112, 113, 116, 132
Toccus hartlaubi	688	squamistrigatus	113
Todirostrum cinereum	174	Tridentipes	663
Togoro-iwashi	463	Trifissus	113
Tokosiu	582	ioturus	112, 117
Toledonia, new genus	512	Trigonocephalus	794
perplexa, new species	512, 513	Trigonoceps	719
Tolmerus	719	Trigonostoma	504, 536
Tolmodus	719	Tringa calidris	684
inflatus	719	lobata	693
Tolmolestes	719	minutilla	164
Tolteca	208	Triodon	230, 263
Tooth-black bera	623	bursarius	230, 263
Topaza pella	321, 322	macropterus	230
pamprepta, new subspecies	321, 322	Triodontidae	229, 230, 263
pella	322	Triptorhinus	682
pyra	309, 322	Tritonellium	520, 521
Torabuku	238, 258	barthi	520
Tora-gisu	467	Tritonium	521
-haze	467	behringii	528
Toria	712	beringii	528
Totanus guttifer	709	borealis	538
Trachinidae	461	craticulatum	538

	Page.		Page.
<i>Tritonium fabricii</i>	538	<i>Trochilus villaviscensio</i>	315
<i>oides</i>	531	<i>wilsoni</i>	326
<i>ovoides</i>	531	<i>yaruqui</i>	312
<i>rossii</i>	537	<i>Troglodytes paradoxus</i>	682
<i>Tritonofusus</i>	520, 521, 522, 523	<i>punctatus</i>	680, 716
<i>brunneus</i>	525, 564	<i>rufulus</i>	177
<i>hallii</i>	525, 564	<i>Troglodytidae</i>	177, 729
<i>herendeeni</i> , new species.....	527, 564	<i>Trogon</i>	718
<i>martensi</i>	526, 564	<i>collaris</i>	170
<i>rectirostris</i>	525, 564	<i>temnurus</i>	718
<i>roseus</i>	526, 564	<i>Trogonidae</i>	170, 729
<i>spitzbergensis</i>	526, 564	<i>Trophon</i>	521, 527, 532, 533, 535, 536, 540, 547
<i>virens</i>	525, 564	<i>abyssorum</i>	540
<i>Trochilidae</i>	171, 729	<i>actinophorus</i>	541
<i>Trochilus</i>	719	<i>alveolatus</i>	535
<i>amabilis</i>	316	<i>candelabrum</i>	543
<i>aurescens</i>	323	<i>cerrosensis</i>	534, 549
<i>auritus</i>	339	<i>clavatus</i>	540
<i>barroti</i>	339	<i>coronatus</i>	548
<i>benjamini</i>	332	<i>cossmanni</i>	540
<i>bicolor</i>	685	<i>crispus</i>	535
<i>bougueri</i>	323	<i>dalli</i>	548
<i>chimborazo</i>	322	<i>droueti</i>	542
<i>condamini</i>	314	<i>fabricii</i>	542
<i>cristatus</i>	669	<i>geversianus</i>	533
<i>cyaneus</i>	319	<i>gooderichi</i>	548
<i>cyanurus</i>	336	<i>goodridgei</i>	548
<i>derbyi</i>	331	<i>gunneri</i>	543
<i>edward</i>	316	<i>gyratus</i>	535
<i>eurypterus</i>	336	<i>lamellosus</i>	548
<i>exortis</i>	333	<i>magellanicus</i>	521
<i>fannyi</i>	319	<i>muriciformis</i>	548
<i>forficatus</i>	676	<i>orpheus</i>	542
<i>gigas</i>	315	<i>pelecetus</i> , new species.....	535
<i>goudoti</i>	316	<i>pinnatus</i> , new species.....	534, 549
<i>gracilis</i>	337	<i>richardsonii</i>	537
<i>grayi</i>	317	<i>scalariformis</i>	544
<i>herrani</i>	335	<i>stuarti</i>	527, 542
<i>hirsutus</i>	311	<i>subseratus</i>	541
<i>hispidus</i>	313	<i>triangulatus</i>	534, 548
<i>jamersoni</i>	324	<i>truncatus</i>	544
<i>jardini</i>	328	<i>unicarinatus</i>	536
<i>johannae</i>	310	<i>vaginatus</i>	540
<i>langsdorffi</i>	342	<i>verrilli</i>	540
<i>lazulus</i>	315	<i>Trophonopsis</i>	533,
<i>leadbeateri</i>	324	534, 535, 538, 539, 541, 542, 545, 546	
<i>luciani</i>	329	<i>dabneyi</i>	539
<i>lutetiae</i>	325	<i>droueti</i>	539
<i>magnificus</i>	693	<i>grimaldii</i>	539
<i>matthewsii</i>	328	<i>richardi</i>	539
<i>melananthera</i>	331	<i>varicosissimus</i>	539
<i>melanogenys</i>	332	<i>Tropidichthyidae</i>	229, 230, 254, 264
<i>mellivorus</i>	315	<i>Tropidichthys</i>	254
<i>minor</i>	719	<i>valentini</i>	254
<i>mitchellii</i>	341	<i>Troschelia</i>	524
<i>mocoa</i>	336	<i>True puffer</i>	238, 244
<i>mosquera</i>	330	<i>Trutta</i>	577
<i>nigrivestis</i>	331	<i>trutta</i>	577
<i>nigrofasciata</i>	319	<i>Truttæ</i>	577
<i>propelairii</i>	342	<i>corpore variegato</i>	577
<i>pyra</i>	322	<i>Trygon</i>	719
<i>saul</i>	327	<i>Tryonia</i>	275, 276, 282
<i>schreibersii</i>	324	<i>clathrata</i>	282, 286
<i>stanleyi</i>	335	<i>protea</i>	277
<i>strophianus</i>	333	<i>Trypauchen</i>	37, 126, 132
<i>theresiæ</i>	710	<i>vagina</i>	126, 127, 128
<i>tyrianthinus</i>	334, 691	<i>wakæ</i> , new species.....	127, 132

	Page.		Page.
Tryzusa	720	Upupa pyrrhocorax	697
Tschawitscha	570	Uraniscodon	182
Tschawytscha	570	Uranoscodon	182
Tucaius	694	Uranoscopidae	462, 473, 482, 497
Tucanus	678	Uranoscopinae	473
Tupaia	773	Uranoscopus	473, 474, 480, 497
nicobarica	773, 791, 793	asper	474, 475
nicobarica nicobarica	773,	bicinctus	474, 476, 497
774, 775, 776, 792, 793		elongatus	478
nicobarica surda, new subspe-		inermis	476
cies	774, 776, 792	japonicus	474, 475, 497
nicobaricus	795	lebeck	476
Tupia nicobaricus	795	oligolepis	474, 497
Turacena	686	scaber	474
Turacenas crassirostris	675	Uratelornis	720
Turdidae	178, 729	chimaera	720
Turdus guttatus	718	Urcu-Quinde	322
Turdus cafer	670	Urichthys	653
figulus	690	lunulatus	653
guajanus	701	Urile	692
montanus	666	Uroætes brachialis	717
Turnicidae	729	Urocampus	5, 10, 20
Turtur	688	nanus	10, 11
Turturana	720	rikuzenius, new species	10, 20
Tusalia	720	Urocaris infraspinis, new species	903
Two New Species of Algæ of the Genus		longicaudata	903
Buthotrephis, from the Upper Silurian		Urochroa bougueri	323
of Indiana, by David White	265	Urococyx	720
Tylosycteris	778	Urocyon aquilus	146
pachypus	778, 792, 793	Uroderma planirostris	148
Tylopteryx	720	Urodrepanis	720
Tympanomium	260	Urophlexis	720
mola	260	Urosalpinx	533
planci	260, 261	floridanus	505
Typanus	720	perrugatus	505
Typhis martyria, new species	550	Urosphena	720
quadratus	550	Urosticte benjamini	332
Typhlogobius californiensis	120	ruficrissa	332
Typopus	663	Utah, Henicops Dolichopus, a New Chilo-	
Tyrannide	173, 729	pod from, by Ralph V. Chamberlin	797
Tyrannus dominicensis	173	Utriculus mayoi	502
Tyto	720	Valenciennesa	35, 42, 129
Ubellus coman	335	muralis	42, 129
finos	335	strigata	42
Udotea	269	Valenciennesia strigata	42
Ukko	529	Valvata humeralis	278
Uloboridae	219	Vampyrus helleri	149
Uloborus geniculatus	219	lineatus	149
zosis	219	vittatus	149
Ulocomus	720	Vanellus	684
Umbla	581	Vanga flaviventris	695
alpinus	581	Variabilis	145
umbla	581	Variola louti	607
Umbraculum rushii	502, 563	Vehilius almonensis, new species	448
Umi-tanago	357	carasta, new species	449
Unfigured, New, or Imperfectly Known		chinta, new species	449
Shells, Chiefly American, in the United		venosus	448
States National Museum, Illustrations		Veneridae	509
and Descriptions of, by William Healey		Venus	560
Dall	499	kennicottii	560, 565
United States National Museum, Illustrations		Verdes	318
and Descriptions of New, Un-		Verreo, new genus	612, 619, 661
figured, or Imperfectly Known Shells,		oxycephalus	619, 661
Chiefly American, in the, by William		unimaculatus	620
Healey Dall	499	Vesperugo abramus	779, 780, 993, 794
United States, Southern, Description of		nicobaricus	779, 780, 795
Three New Birds from the, by Edgar A.		pachypus	778, 793, 794
Mearns	915	tenuis	779, 780, 795

	Page.		Page.
<i>Vesperugo tickelli</i>	779, 798, 794	<i>Xanthixus</i>	721
<i>Vestipedes</i>	721	<i>Xanthochlamys</i>	721
<i>alinae</i>	331	<i>Xanthoconus</i>	721
<i>derbyi derbyi</i>	331	<i>Xanthoura caeruleocephala</i>	175
<i>longirostris</i>	331	<i>Xema</i>	673
<i>luciani</i>	329, 330	<i>Xenicidae</i>	726
<i>lugens</i>	330	<i>Xenopsaris</i>	709, 721
<i>mosquera mosquera</i>	330	<i>Xerophila</i>	668
<i>nigrivestis</i>	331	<i>Xylobucco</i>	674
<i>squamata</i>	330	<i>Xyrichthyinae</i>	613
<i>vestitus</i>	330	<i>Xyrichthys</i>	654
<i>smaragdinipectus</i>	330	<i>dea</i>	654
<i>Vicente</i>	329	<i>pavo</i>	654
<i>Vireo chivi agilis</i>	177	<i>puniceus</i>	655
<i>Vireomida</i>	177	<i>Yaniabai</i>	578
<i>Vireosa</i> , new genus	34, 38, 129	<i>Yamabe</i>	572, 578
<i>hanae</i> , new species	38, 129	<i>Yamame</i>	578
<i>Viridonia</i>	721	<i>Yanagibuku</i>	238
<i>sagittirostris</i>	721	<i>Yatsumebuku</i>	257
<i>Vitrea raderi</i>	500, 562	<i>Yezomasu</i>	571
<i>Viudas</i>	310	<i>Yokobuku</i>	255
<i>Vivia</i>	706	<i>Young ayu</i>	584
<i>Volatinia jacarini splendens</i>	175	<i>sagi</i>	589
<i>Voluta dubia</i>	504	<i>Yozia</i> , new genus	5, 8, 19
<i>stearnsii</i>	517	<i>coarctata</i>	9
<i>Volutopsis</i>	521	<i>wakanoura</i> , new species	8, 19
<i>attenuata</i>	529	<i>Yunx minuta</i>	706
<i>beringi var. regularis</i>	529	<i>Zalembius rosaceus</i>	354
<i>Volutopsis</i>	521, 523, 530	<i>Zalias</i>	721
<i>attenuatus</i>	529, 564	<i>Zalises</i> , new genus	2, 19
<i>beringii</i>	528, 529, 564	<i>draconis</i>	2
<i>castanea</i>	528	<i>umitengu</i> , new species	2, 19
<i>castaneus</i>	528, 529, 564	<i>Zanclostomus</i>	692
<i>kennicottii</i>	528	<i>flavirostris</i>	692
<i>kobelti</i>	528, 564	<i>Zanzibarensis</i>	9
<i>malleatus</i>	528	<i>Zaprionus</i> , new genus	31
<i>regularis</i>	529, 564	<i>vittiger</i> , new species	32
<i>trophonius</i> , new species	527	<i>Zapterus</i>	683, 721
<i>Vultur</i>	686, 714, 715, 719	<i>Zarhynchus</i>	721
<i>californianus</i>	686	<i>Zeldora flabellum</i>	555, 565
<i>imperialis</i>	715	<i>Zeledonia</i>	721
<i>occipitalis</i>	719	<i>coronata</i>	721
<i>pileatus</i>	672	<i>Ziphila lugubris</i>	139
<i>pondicerianus</i>	714	<i>Zodalia glyceria</i>	338
<i>Vulturidae</i>	729	<i>ortoni</i>	338
<i>Wakasagi</i>	589	<i>thaumasta</i> , new species	338
<i>Wala vernalis</i>	224	<i>Zonifer</i>	722
<i>Warszewiczia</i>	721	<i>Zonitoides milium</i>	500
<i>White, David</i> , on Two New Species of <i>Algae of the Genus Buthotrephis</i> , from the Upper Silurian of Indiana	265	<i>pugetensis</i>	500
<i>White-fish</i>	591	<i>pugetensis</i>	500, 562, 563
<i>Willow puffer</i>	238	<i>Zonogobius semifasciatus</i>	54
<i>Winter perch</i>	614	<i>Zonophaps</i>	722
<i>Wrasse-fishes</i>	612	<i>Zosterornis</i>	722
		<i>whiteheadi</i>	722

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